ACADEMIC REGULATIONS & CURRICULUM

Applicable to the students admitted from the Academic Year 2019-2020

COMPUTER SCIENCE AND ENGINEERING & INFORMATION TECHNOLOGY

(B.Tech. Programme)

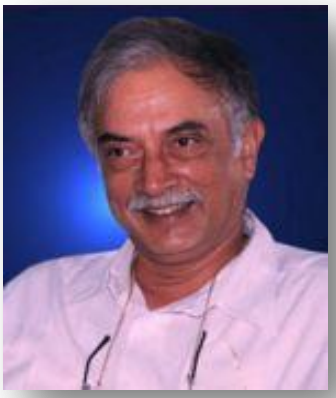
MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING (Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUK, Kakinada)
Listed u/s 2(f) & 12(B) of UGC Act 1956.
Vijayaram Nagar Campus, Chintalavalasa,Vizianagaram-535005, Andhra Pradesh

The visionaries

Late Dr. P V G Raju
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

Late Dr. P. Anand Gajapathi Raju
Ex-Chairman-MANSAS
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament



P. Ashok Gajapathi Raju
Chairman-MANSAS
Ex-Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP

Vision

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

Mission

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity. Towards that end, the management believes special focus has to be on the following areas:

M1: Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.

M2: Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.

M3: Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.

M4: Having a centralized department focused on improving placement opportunities for our students directly on campus and coordinating the training programs for students to complement the curriculum and enhance their career opportunities.

M5: Having advanced research facilities and more importantly atmosphere to encourage students to pursue self-learning on advanced topics and conduct research.

ABOUT THE INSTITUTION:

Maharajah Alak Narayan Society of Arts and Science (MANSAS) is an Educational Trust founded by Dr. (late) P.V.G Raju, Raja Saheb of Vizianagaram in the hallowed memory of his father Maharajah Alak Narayan Gajapati with a view to confound socio-economic inequalities in the Vizianagaram principality executing a trust deed on 12-11-1958 duly established Maharajah's College and other educational institutions in and around Vizianagaram. The Trust is a charitable one published under Section 6 a (1) of A.P Charitable and Hindu Religious Institutions and Endowment Act 30 of 1987.

The object of the Trust is to manage the properties of educational institutions under it and to promote and advance the cause of education in general, besides awarding scholarships to deserving students enabling them to undergo special training in science and industries in and out of India. The Trust has made an uncompromising contribution to the nation by presenting the stalwarts.

Trust offers KG to PhD level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 13 Educational Institutions. MVGR College of Engineering is one of the 13 Institutes.

Other Institutions under MANSAS

1. M.R. HIGH SCHOOL 1857
2. M.R COLLEGE **(NAAC ACCREDITED)** 1879
3. M.R. COLLEGE OF EDUCATION 1950
4. M.R. WOMENS COLLEGE **(NAAC ACCREDITED)** 1962
5. M.R. GIRLS HIGH SCHOOL 1974
6. M.R. MODEL HIGH SCHOOL 1974
7. M.R. ENGLISH MEDIUM SCHOOL 1979
8. M.R.V.R.G.R LAW COLLEGE 1987
9. M.R. P.G. COLLEGE **(NAAC ACCREDITED)** 1987
10. M.R.SCHOOL OF MANAGEMENT STUDIES 1994
11. M.R.V.R.G.R – II MEMORIAL JR. COLLEGE 1994
12. M.R. COLLEGE OF PHARMACY 2004

Maharaj Vijayaram Gajapathi Raj (MVGR) College of Engineering was established in the year 1997 by Maharaj Alak Narayan Society for Arts and Sciences (MANSAS) to impart quality technical education. The Institution is located in lush green, serene and pollution free environment spread over 60 acres of land in Chintalavalasa village situated in the outskirts of Vizianagaram, a fort city in the north coastal region of Andhra Pradesh.

Institution at a glance:

- MVGR is a 23 years old institution, established in 1997
- All eligible UG Programs (CHEMICAL, CIV, CSE, ECE, EEE, IT & MECHANICAL) were reaccredited by NBA.
- MBA program was also re-accredited by NBA.
- Had been re-accredited with Grade 'A' by NAAC of UGC
- Has Permanent affiliation with JN Technological University-Kakinada
- Listed under sections 2(f) & 12(b) of UGC act 1956.
- Approved by AICTE-New Delhi
- EIGHT departments are recognized as RESEARCH CENTERS by JNTU-K
- Granted Autonomy by UGC in 2015
- Campus of 60 acre
- Offering 7 UG and 5 M.Tech., and 1 MBA program
- About 250 faculty of which 84 Ph.D. Degree holders
- 83 Laboratories with an investment of about 13 Crores
- Total built up area of about 7 Lakh Sft
- About 42,000 volumes and Access to 8 international online journal packages like IEEE, SPRINGER, etc.
- 1420 Systems & 395 Mbps band width internet facility
- About Rs. 4 Crore worth of on-going R&D projects
- Actively involved in civil engineering consultancy work as Third Party Quality Auditor for Vizianagaram Municipality
- WIPRO Recognized technology learning center and MISSION 10X partner institution
- Recognized National Instruments Academy for Training in LabView
- SIRO Recognition by DSIR
- Recognized PTC Centre of Excellence for Creo Training
- Identified by MSME as Business Incubation Centre
- APSSDC-Siemens Technical Skill Development Institute
- Recognized CMs SKILL EXCELLENCY CENTER (SEC)
- Microsoft Ed-vantage Platinum Partner
- Institutional member of IUCEE
- Institutional Member of CII
- Member, Chamber of Commerce, Vizianagaram
- Green Campus award by Govt. of AP

MVGR College of Engineering is rated as one among the best engineering colleges in the state of Andhra Pradesh as it set up highest standards in all areas of curricular, co-curricular and extra-curricular activities and in students' placements. Based on industry and expert's feedback, the college is updating the curriculum from time to time. The college offers many value added add-on courses students and conducts training programs to meet the industries' requirements.

Academic Regulations for B.Tech., Program

Applicable to the students admitted from the Academic year 2019-2020 onwards.

1. PROGRAM STRUCTURE:

B.Tech.:

Sl. No	Category	Credits
1	Humanities and Social Sciences including Management courses	12
2	Basic Science courses	25
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	26
4	Professional core courses	54
5	Professional Elective courses relevant to chosen specialization/branch	18
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	13
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	0
	Total	160

- Open electives offered by the parent department are listed in the course structure and are offered to students of other programs. The students of parent departments may also opt the course, provided it shall not be listed in the curriculum.
- For audit course a student is deemed to satisfy the minimum contact hours, as prescribed by the department and shall also comply with the requirements for submission of assignments/projects. A student shall also opt for MOOCs and submit the certificate.

1. HSS Courses		
Sl. No.	Subject	Credits
1	English -1	3
2	English -2 (Technical English)	3
3	Elective-1 (Management Related course (MEFA or MS or Operations Research)	3
4	Elective-2 (Professional Ethics and Human Values)	3
	Total	**12**

2. Basic Science Courses		
Sl. No.	Subject	Credits
1	Mathematics-I	3
2	Mathematics-II	3
3	Mathematics-III	3
4	Mathematics-IV	3
5	Applied / Engineering Physics (Theory + Lab)	5
6	Engineering Chemistry (Theory + Lab)	5
7	Biology for Engineers	3
	Total	**25**

3. Engineering Science Courses		
Sl. No.	Subject	Credits
1	Programming for Problem Solving (Theory + Lab)	5
2	Internet of Things (IOT)	3
3	Computer aided Engineering Graphics	3
4	Basic Electrical Engineering (Theory + Lab)	5
5	Department wise Engineering Science Course-I (AI Tools , Techniques & Applications)	5
6	Department wise Engineering Science Course-II (Design thinking and Product Innovation)	3
7	Workshop (Department Specific)	**2**
	Total	**26**

	Subjects	Credits
1	Professional Core Courses	54
2	Professional Elective Courses Relevant to Chosen Specialization/Branch	18
3	Open Subjects – Electives from other Technical and / or Emerging Subjects	12
		84

7. Project		
Sl. No.	Subject	Credits
1	Socially Relevant Project	1
2	Mini Project	2
3	Project Phase - I	2
4	Project Phase - II	8
	Total	**13**

8. Audit Courses (Non Credit Course)		
Sl. No.	Subject	
1	Induction Program	
2	Constitution of India	
3	Indian Traditional Knowledge	
4	Environmental Science	

BOS Chairman shall notify the list of MOOCs offered (Open Elective & Professional Elective) in the beginning of the semester.

2. PROGRAM PATTERN:

B.Tech.: The program is for 4 academic years / 8 semesters.

B.Tech. (Lateral Entry): The program is for 3 academic years / 6 semesters.

3. AWARD OF DEGREE:

B.TECH:

A student will be declared eligible for the award of degree if he/she fulfills the following academic regulations.

a) A student shall be declared eligible for the award of degree, if he/she pursues a course of study for not less than four academic years and not more than eight academic years from the date of admission.

b) The student shall register for **160** credits and secure all **160** credits.

c) The medium of instruction for the entire under graduate program in Engineering & Technology will be in **English** only.

d) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

e) A student on completing 1st year class work may opt for a break of 1 year which shall be deemed as GAP year, as recommended by APSCHE, for undertaking successful entrepreneurial ventures.

f) Students who fail to complete Four Years Course of study within 8 years shall forfeit their seat and their admission shall stand cancelled.

B.TECH (Lateral Entry):

A student will be declared eligible for the award of degree on fulfilling the following academic requirements.

a) A student shall be declared eligible for the award of the degree, if he/she pursues a course of study for not less than three academic years and not more than six academic years.

b) The student shall register for **126** credits and secure all **126** credits.

c) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

d) Students who fail to complete their three Years Course of study within 6 years shall forfeit their seat and their admission shall stand cancelled.

e) Student shall register for bridge programs, if any, as administered by the respective departments at the beginning of 2nd year and successfully complete as per the guidelines of the Institution.

4. CERTIFICATION PROGRAMS:

Sl. No.	Dept.	Name of the Program
1	MECH	Windchill 10.2 PDM by Adroitec Engineering Solutions Pvt. Ltd., Hyderabad
2	MECH	Creo 2.0 by PTC
3	MECH	Edgecam by Verosoft, UK
4	MECH	ANSYS Training and Certification by Mechanical Department
5	MECH	AUTOCAD Training and Certification by Mechanical Department
6	MECH	Catia by APSSDC-Dassault Systems, CM's Center of Excellence
7	MECH	Delmia by APSSDC-Dassault Systems, CM's Center of Excellence
8	MECH	Simulia by APSSDC-Dassault Systems, CM's Center of Excellence
9	MECH	2-Wheeler Automobile Certification by APSSDC-SIEMENS
10	MECH	4-Wheeler Automobile Certification by APSSDC-SIEMENS
11	MECH	Welding Certification by APSSDC-SIEMENS
12	MECH	CNC Certification by APSSDC-SIEMENS
13	MECH	Commercial Electrical Certification by APSSDC-SIEMENS
14	MECH	Solid Edge Certification by APSSDC-SIEMENS
15	CHEM	Chemical Process Design and Simulation by Simtech Simulations, Hyderabad
16	ECE	Embedded Systems by Think LABS, Mumbai
17	ECE	Labview by National Instruments Systems India Pvt. Ltd.
18	ECE	Unified Technology Learning Program (UTLP) by Wipro Mission 10X
19	CSE, IT	PEGA by Virtusa Corporation
20	CSE, IT	Microsoft technologies by Microsoft Corp.
21	CSE, IT	Ethical Hacking by EC-Council Academia
22	CSE, IT	Java and C by Talent Sprint
23	CSE, IT	Network Analyst (CCNA) by Cisco Systems Inc
24	CSE, IT	Java Programming (OCJP) and DBMS by Oracle
25	EEE	PLC, Drives and Automation by Siemens
26	EEE	PLC by New Dawn Automation
27	EEE	Home Electrical Certification by APSSDC-SIEMENS
28	Civil	Remote Sensing and GIS by Indian Institute of Remote Sensing

a) The Institution shall offer the certification programs by itself or in collaboration with industry/such other Institutions deemed to have specialized expertise in the proposed area of training.
b) Only students of the Institution shall be eligible to register on payment of prescribed fee.
c) However, subject to availability of resources and the demand the Institution may offer the program to external candidates meeting the pre-qualification requirements and in the order of the merit.
d) The duration of the course and design of the content shall be done by the respective departments of the Institution by themselves or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.
e) If the duration of the course is less than or equal to 40 hours, it can be completed in one semester, otherwise, it can suitably distributed over a number of semesters.
f) Mere enrolment/registration for the program shall not entitle any claim for award of certificate.
g) A candidate shall be deemed eligible for the award of the certificate if he/she
   - Attends at least 75% of scheduled training sessions
   - Complies to all the requirements of submission of the assignments, presentations, seminars, projects, etc., and also appears for periodic tests.
   - Shall attain minimum levels of performance in tests as prescribed.
   - Shall remit such fee as deemed fit for the certification
   - A candidate registered and failed to meet the requirements shall be permitted to repeat the said training one another time after remitting 25% of the fee fixed for the program as re-registration fee.

If the student is absent for the periodic tests, the test shall be re-conducted on payment of 10% of fee.

5. COURSES OFFERED:

Name of the Program	Degree
UG Programs (Engineering & Technology)	B.Tech. (Civil) B.Tech. (EEE) B.Tech. (Mech.) B.Tech. (ECE) B.Tech. (CSE) B.Tech. (CHEM) B.Tech. (IT)
PG Programs (Engineering & Technology)	M.Tech. (Structural Engineering) M.Tech. (Power Systems) M.Tech. (PDM) M.Tech. (VLSI) M.Tech. (CN&IS)
Other PG Programs	MBA
Research Programs	Ph.D. in Civil, EEE, MECH, ECE, CSE, CHEM, MBA and MATHS

6. DISTRIBUTION AND WEIGHTAGE OF MARKS:

B.Tech.:

a). All Theory courses will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:

Subjective tests - 20 Marks
Objective tests - 10 Marks
Assignments - 10 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Two objective tests (online) shall be conducted each for 20 marks.
- Each objective test shall be conducted for 20 minutes and have 20 Multiple Choice Questions each for 1 mark and the same shall be scaled down to 10 Marks.
- Average of two objective tests shall be considered.
- Assignments shall be assessed for 10 marks.

External Assessment:

- External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

i) Design Thinking and Product Innovation - Evaluation pattern

Internal Assessment: 40 Marks

Project based learning - 20 Marks
Assignments - 20 Marks

Project based learning: The student has to identify a problem and provide a solution by applying design thinking methodologies and submit a report, which is assessed for 20 Marks.

Assignments: The student has to submit 4 assignments (1 for each unit) and assessed for 20 marks. Each assignment shall consist of 4 questions (4X10 = 40 marks) and the same shall be scaled down to 20 marks. Average of 4 assignments shall be considered as final assignment marks.

External Assessment: 60 Marks

External examination is for 60 marks (180 min). Question paper contains 8 questions from first IV units (2 questions from each unit) and each question carries 10 marks. Student shall answer 4 questions from first IV units (1 question from each unit) and case study (20 Marks) from V unit.

ii) Internet of Things (IoT) , Surveying and Geomatics, MAT Lab Programming, Programming with Lab View, Embedded Processor - Evaluation pattern

Internal Assessment: 40 Marks

Subjective Test - 20 Marks

Project based learning - 20 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Project based learning shall be assessed for 20 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.

External Assessment: 60 Marks

External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

b). **Laboratory/Practice:**

All Laboratory/Practice courses are assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment : 15 Marks
Project based learning : 15 Marks
Internal test : 10 Marks

- Continuous assessment for 15 marks for each experimental session finally averaged to 15 marks.
- Project based learning shall be assessed for 15 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.
- An internal assessment test conducted at the end of the semester shall be assessed for 10 marks.

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.

- Both internal and external examination shall include assessment of the student on
    a) Knowledge of principles/concepts involved
    b) Experimental design
    c) Result interpretation and analysis
    d) Experimental report

c). **Drawing/Design/Estimation:**

i) Computer Aided Engineering Graphics:

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment	: 15 Marks
Project based learning	: 15 Marks
Internal test	: 10 Marks

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Question paper contains 3 questions (with internal choice). **E**ach question carries 20 marks (5 marks for free hand drawing and list of commands & 15 marks for final drawing prepared in AUTOCAD). A Student shall answer all questions.

ii) Computer Aided Geometric Design and Assembly:

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment	: 15 Marks
Project based learning	: 15 Marks
Internal test	: 10 Marks

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Semester End Examination shall include assessment of the student on Final drawings like modeling, assembly and drafting.
- Student is expected to execute one exercise.

- Final drawings like modeling, assembly and drafting hard copies shall be evaluated by both internal and external examiners

iii) Design and Drawing Courses

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:	**40 Marks**
Subjective Test	- 20 Marks
Assignments	- 10 Marks
Design and Drawing reports	- 10 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Design and drawing reports shall be assessed for 10 marks.

External Assessment:

The end examination question paper consists of Part A and Part B.
Part A consists of two questions regarding Design and Drawing (from two clusters clearly mentioned in the syllabus). Each question carries 20 marks. The student shall answer any 1 question.
Part B consists of four questions (from the remaining four clusters) with internal choice and all four are to be answered. Each question carries 10 marks.

iv) Estimation and Costing Courses

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:	**40 Marks**
Subjective Test	- 20 Marks
Assignments	- 10 Marks
Bar bending schedules,	- 10 Marks
Estimation and cost analysis reports	

Two subjective tests shall be conducted.

- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Bar bending schedules, Estimation and cost analysis reports shall be assessed for 10 marks.

External Assessment:

External examination is for 60 Marks. The question paper consists of 2 questions. Each question carries 60 Marks. The student shall answer 1 question.
In each question, the section, plan and reinforcement drawings of various members of a building will be given and the following items are to be calculated.

- Quantities of all the items (20 Marks).
- Reinforcement tonnage and Bar bending schedule (10 Marks).
- Specifications (10 Marks).
- Rates of all the items as per Standard Schedule of Rates (20 Marks).

Integrated Course (Theory + Lab):

Theory and Lab shall be assessed for 200 Marks (Each 100 marks)

- For Integrated course, the theory shall be assessed for 100 marks, of which 40 marks for internal assessment and 60 marks for semester end external examination.
- The Lab shall be assessed for 100 marks , of which, 40 marks for internal assessment and 60 marks for semester end external examination

Socially Relevant Project:

- A student shall identify and provide a solution to the problem relevant to society/Profession/Industry.
- A student shall engage at least 15 hours on socially relevant project. Socially relevant project shall be evaluated internally for 50 marks by Project Review Committee (PRC). PRC comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress.

Mini Project:

- A student shall undergo internship for a period of 4 weeks/provide solution to the problem relevant to Industry/ Modern tool during the vacation after VI semester and submit comprehensive report.
  - Mini project shall be evaluated internally for 50 marks by Project Review Committee (PRC).
  - PRC shall prepare rubrics for assessment.

Project Evaluation:

Project is divided into 2 phases – Phase I & Phase II

- Evaluation shall comprise of internal and external assessment.

Internal: 110 (Phase I 50 marks, Phase II 60 Marks)

External: 90

- A project Review committee (PRC) comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress once in four weeks.

Project Phase I:

- Project Phase I shall be evaluated internally by PRC for 50 Marks.
- A student shall undertake project phase I during the VII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 2 hours per week.
- Assessment shall be on
  - Literature review
  - Identification and statement of the Problem

Project Phase II:

- A student shall undertake project phase II during the VIII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 8 hours per week.
- Internal evaluation shall be done by HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide for 60 marks.
- External evaluation shall be done by HoD, Guide/Internal Examiner and External Examiner for 90 marks.
- Assessment shall be on
  a) Review on fundamental knowledge involved
  b) Inter disciplinary aspect
  c) Experimental/methodology design
  d) Result analysis and interpretations
  e) Report writing
  f) Team work
  g) Presentation
  h) Viva-voce

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2^{nd}, 3^{rd} and 4^{th} years of study shall be same as applicable to regular B.Tech students.

7. ATTENDANCE REGULATIONS:

B.Tech.:

I. A student shall be eligible to appear for end semester examinations, if he or she acquires a minimum of 75% of attendance in aggregate of all the subjects (Theory & Lab.) for the semester.

II. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the college academic committee.

III. Shortage of attendance below 65% in aggregate of all the subjects (Theory & Lab) for the semester shall not be Condoned.

IV. Detained student shall seek re- admission for that semester when offered within 4 weeks from the date of commencement of class work.

PROMOTION RULE (Based on attendance):

- A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement (75%) of current semester.

PROMOTION RULE (Based on credits):

- A student shall be promoted from IV semester to V semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to IV semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Two regular and Two supplementary examinations of I semester
    - Two regular and One supplementary examinations of II semester
    - One regular examination and One supplementary examination of III semester
    - One regular examination of IV semester.
- A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Three regular and Three supplementary examinations of I semester
    - Three regular and Two supplementary examinations of II semester
    - Two regular and Two supplementary examinations of III semester
    - Two regular and One supplementary examinations of IV semester
    - One regular and One supplementary examination of V semester
    - One regular examination of VI semester.

B.TECH (Lateral Entry):

PROMOTION RULE (Based on attendance):

A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement of current semester.

PROMOTION RULE (Based on credits):

A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.

- Two regular and Two supplementary examinations of III semester
- Two regular and one supplementary examinations of IV semester
- One regular and One supplementary examinations of V semester
- One regular examination of VI semester.

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

8. MINIMUM ACADEMIC REQUIREMENTS:

B.Tech.: (Theory/Lab)

i. A student is deemed to have satisfied the minimum academic requirements for a course on securing at least 24 marks out of 60 marks at semester end examination and overall minimum of 40 marks out of 100 marks including internal assessment.

ii. **Integrated Course (Theory + Lab):**

- The student shall secure minimum 24 marks out of 60 marks at semester end examination and overall 40 marks out of 100 marks for Theory and Laboratory courses independently. In case of failure in either theory or Laboratory course, the student should re-appear for both theory and laboratory.
- The assessment shall be done independently for both theory and laboratory courses and final marks shall be calculated on weighted average method for converting marks into grade points.

Sample calculation:

Integrated course-5 credits. Theory is for 3 credits and laboratory is for 2 credits.

Total Marks obtained in theory: 70 out of 100 (3 Credits)

Total Marks obtained in Lab : 90 out of 100 (2 Credits)

Final marks of the integrated course is

(70X3 + 90X2) / 5 = 78 Marks

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

9. GRADING SYSTEM:

B.Tech. / B.Tech. (Lateral Entry)

Semester Grade Point Average (SGPA) for the current semester which is calculated on the basis of grade points obtained in all courses, except audit courses and courses in which satisfactory or course continuation has been awarded,

SGPA= Σ (course credits earned x Grade points) /
Σ (Total course credits in the semester.

CGPA= Σ (course credits earned x Grade points) up to successfully completed semesters) / Σ (Total course credits up to successfully completed)

The UGC recommends a 10-point grading system with the following letter grades as given below:

O	(Outstanding)	10
A+	(Excellent)	9
A	(Very Good)	8
B+	(Good)	7
B	(Above Average)	6
C	(Average)	5
P	(Pass)	4
F	(Fail)	0
Ab	(Absent)	0

- iii. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			**139**

Thus, **SGPA** =139/20 = 6.95

Illustration for CGPA

Semester 1	**Semester 2**	**Semester 3**	**Semester 4**	**Semester 5**	**Semester 6**
Credits: 16	Credits: 18	Credits: 25	Credits: 21	Credits: 23	Credits: 22
SGPA: 7.9	SGPA: 7.8	SGPA: 7.6	SGPA: 8.0	SGPA: 8.3	SGPA: 8.6

Semester 7	**Semester 8**
Credits: 21	Credits:14
SGPA: 8.2	SGPA: 8.5

Thus,

CGPA= $\frac{16x7.9 + 18x7.8 + 25x7.6 + 21x8.0 + 23x8.3 + 22x8.6 + 21x8.2 + 14x8.5}{\mathbf{160}}$ = **8.1**

10. ELIGIBILITY FOR AWARD OF DEGREE:

B.Tech:

A student shall be eligible for award of the degree if he/she fulfills the following conditions:

1) Successfully completes all the courses prescribed for the Program.
2) CGPA greater than or equal to 4.5(Minimum requirement for Pass),

11. AWARD OF CLASS:

B.Tech:

Eligible Candidates for the award of B.Tech., Degree shall be placed in one of the following Classes based on CGPA.

Class	CGPA
Distinction	≥ 7.5
First Class	≥ 6.5
Second Class	≥ 5.5
Pass class	≥ 4.5

12. INSTRUCTION DAYS:

A semester shall have a minimum of 90 clear instruction days (including internal examinations).

13. Transfers from other Institutions shall not be permitted.

14. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations shall be conducted within 4 weeks from the date of announcement of results of regular examinations.

15. WITHHOLDING OF RESULTS: The result of a student shall be withheld

- If the student has not paid the dues, if any, to the institution
- If any case of pending disciplinary action ,
- Involvement in any sort of malpractices etc.
- Involvement in ragging.

16. TRANSITORY REGULATIONS:

a) Detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules and regulations under which the candidate has been admitted.

c) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. The transferred candidates have to write the backlogs/failed subjects, if any, in the same Institution where he/she was admitted.

17. AMENDMENTS TO REGULATIONS:

The Academic Council of MVGR College of Engineering (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other such matter relating to the requirements of the program which are compatible to the contemporary/emerging trends effectively meeting the needs of society/industry/stake holding groups.

18. Regulations for MALPRACTICES during the conduct of examinations

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only. *
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. *

2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled. *
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider/candidate not on rolls, he will be handed over to the police and a case is registered against him. *
4	If the candidate mishandles the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. Also if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the bar code intentionally.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. He shall be debarred from class work and all examinations and be allowed to reregistered for the next subsequent odd or even semester only. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.*

5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	The same should be brought to the notice of CE who in turn in consultation with malpractice committee makes decision for cancellation of the performance in that subject. *
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. *
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. *
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. *

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. *
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. *
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.*

*

19. General :

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

* * *

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- **Ragging within or outside any educational institution is prohibited.**
- **Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student**

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	 1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	 2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	 5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	 10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE MVGR A RAGGING FREE CAMPUS

Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.

2. Ragging entails heavy fines and/or imprisonment.

3. Ragging invokes suspension and dismissal from the College.

4. Outsiders are prohibited from entering the College and Hostel without permission.

5. Girl students must be in their hostel rooms by 7.00 p.m.

6. All the students must carry their Identity Cards and show them when demanded

7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

PROGRAM STRUCTURE

B. TECH – COMPUTER SCIENCE AND ENGINEERING

&

DEPARTMENT OF INFORMATION TECHNOLOGY

(A2 Regulation)

SEMESTER-I						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT101	Mathematics-I	3	-	-	3
2	A2PYI102	Applied Physics (Integrated Course)	3	-	3	5
3	A2CII201	Programming for Problem Solving (Integrated Course)	3	-	3	5
4	A2MED201	Computer Aided Engineering Graphics	1	-	4	3
5	A2EHA701	Constitution of India	2	-	-	0
Total number of Credits:						**16**

SEMESTER-II						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT103	Mathematics-II	3	-	-	3
2	A2CYI101	Engineering Chemistry (Integrated Course)	3	-	3	5
3	A2EEI201	Basic Electrical Engineering (Integrated Course)	3	-	3	5
4	A2EHL001	Essential Communication in English	1	-	3	3
5	A2CIW201	Basic IT Tools Workshop	-	-	4	2
Total number of Credits:						**18**

SEMESTER-III						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MST001	Managerial Economics and Financial Analysis	3	-	-	3
2	A2MST002	OE-I: Human Resources Development and Organizational Behavior	3	-	-	3
3	A2MAT104	Mathematics-III	3	-	-	3
4	A2CIT202	Design Thinking and Product Innovation	3	-	-	3
5	A2CIT301	Digital Logic Design	3	-	-	3
6	A2CII301	Data Structures (Integrated Course)	3	-	3	5
7	A2CII302	Programming with Python (Integrated Course)	3	-	2	4
8	A2EHA702	Essence of Indian Traditional Knowledge	2	-	-	0
Total number of Credits:						**24**

SEMESTER-IV						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CHT101	Biology for Engineers	3	-	-	3
2	A2MAT108	Mathematics-IV	3	-	-	3
3	A2CIT302	Computer Organization and Architecture	3	-	-	3
4	A2CIT507	Mathematical Modeling	3	-	-	3
5	A2CII303	Computer Networks (Integrated Course)	3	-	3	5
6	A2CII304	Object Oriented Programming (Integrated Course)	3	-	3	5
7	A2CHA701	Environmental Science	2	-	-	0
Total number of Credits:						**22**

Semester – V						
S. No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	
1	A2CII202	AI Tools, Techniques & Applications (Integrated Course)	3	-	3	5
2	A2CII305	Database Management Systems (Integrated Course)	3	-	3	5
3	A2CIT303	Design & Analysis of Algorithms	3	-	-	3
4	A2CIT304	Operating Systems	3	-	-	3
5	A2CIT305	Automata Theory & Compiler Design	3	-	-	3
6	A2CIT4XX	Professional Core Elective-I	3	-	-	3
7	A2CIP601	Socially Relevant Project	-	-	2	1
						23

Semester - VI						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	
1	A2CII306	Web Technologies (Integrated Course)	3	-	3	5
2	A2CIT306	Software Engineering	3	-	-	3
3	A2CIT307	Microprocessors & Interfacing	3	-	-	3
4	A2CIT4XX	Professional Core Elective-II	3	-	-	3
5	A2CIT4XX	Professional Core Elective-III	3	-	-	3
6	A2EHT001	Effective Technical Communication	3	-	-	3
7	A2CIP602	Mini Project	-	-	4	2
						22

Semester – VII						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	
1	A2CIT201	Internet of Things (IOT)	2	-	2	3
2	A2EHT002	Professional Ethics and Human Values	3	-	-	3
3	A2CIT308	Object Oriented Design & Analysis and Design Patterns	4	-	-	4
4	A2CIT4XX	Professional Core Elective-IV	3	-	-	3
5	A2CIT4XX	Professional Core Elective-V	3	-	-	3
6	A2CIT4XX	Professional Core Elective-VI	3	-	-	3
7	A2CIP603	Project (Phase-I)	-	-	4	2
						21

Semester – VIII						
S. No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	
1	A2XXT5XX	Open Elective-III (MOOCs)	3	-	-	3
2	A2CIT508	Open Elective-IV (MOOCs)	3	-	-	3
3	A2CIP604	Project (Phase – II)	-	-	16	8
						14

ELECTIVE STREAMS (MAJORS)

CI-EG1 (Code-1) – Business Intelligence (A2CIT41X)	
Subject Code	**Subject**
A2CIT411	Data Warehousing & Mining
A2CIT412	Statistical & Predictive Analytics
A2CIT413	Data Analytics & Tools
A2CIT414	Machine Learning

CI-EG2 (Code-2) – Networks (A2CIT42X)	
Subject Code	**Subject**
A2CIT421	Routing and Switching Concepts
A2CIT422	Firewalls & VPN
A2CIT423	Penetration Testing
A2CIT424	Information Security and Management Standards

CI-EG3 (Code-3) – Architecture (A2CIT43X)	
Subject Code	**Subject**
A2CIT431	Service Oriented Architecture
A2CIT432	Middleware Technologies
A2CIT433	Block chain fundamentals
A2CIT434	.NET Technologies/EJB
CI-EG4 (Code-4) – Applications (A2CIT44X)	
Subject Code	**Subject**
A2CIT441	Bio-Informatics
A2CIT442	Digital Image Processing
A2CIT443	Digital Forensics & Investigations
A2CIT444	E-Commerce

Core Elective – V (A2CIT4XX)	
Subject Code	**Subject**
A2CIT411	Data Warehousing & Mining*
A2CIT421	Routing and Switching Concepts*
A2CIT431	Service Oriented Architecture*

Core Elective – VI (Code-9) (A2CIT46X)	
Subject Code	**Subject**
A2CIT491	Natural Language Processing
A2CIT492	Cryptography and Information Security
A2CIT493	Cloud Computing (Salesforce/Amazon)
A2CIT494	Enterprise Resource Planning
A2CIT433	Block chain fundamentals*

** Cannot Opt if already completed*

GUIDELINES FOR CHOOSING THE CORE ELECTIVES

- A Student has an option to choose **ONE** among the following Streams as a Major Group and complete 4 courses listed that group as Core Electives I, II, III and IV fromthe respective group.

    1. Business Intelligence
    2. Networks
    3. Architecture
    4. Applications

- A Student has to choose any ONE from the list of courses in the table of CoreElective – V, which he has not studied earlier.

- A Student may choose any ONE among the courses Listed in Core Elective – VItable, which he has not studied earlier.

Note: Each department is offering 4 open elective courses. One elective course is from Humanities (Human Resources Development and Organizational Behavior) which is common to all Engineering departments. 2nd Open elective course should be opted from the other departments (List of Open elective courses offered by various departments are given below). 3rd and 4th Open elective courses (Emerging subjects) should be discipline centric.

OPEN ELECTIVES

OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CET501	Remote Sensing and GIS	3	-	-	3
2	A2CET502	Project Planning and Management	3	-	-	3
3	A2CET503	Road Safety Engineering	3	-	-	3
4	A2CET504	Geomatics	3	-	-	3
5	A2CET505	Building Services	3	-	-	3
6	A2CET506	Water Power Engineering	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF EEE						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EET501	Basic Control Systems				
2	A2EET502	Applied Electrical Engineering				
3	A2EET503	Electrical Safety				
4	A2EET504	Concepts of Electrical Wiring				
5	A2EET505	Basic Automation Course				
6	A2EET506	Illumination Engineering				
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MET501	Introduction to Robotics	3	-	-	3
2	A2MET502	Solar and Wind Energy	3	-	-	3
3	A2MET503	Production and Operations Management	3	-	-	3
4	A2MET504	Micro Electromechanical Systems	3	-	-	3
5	A2MET505	Product Lifecycle Management	3	-	-	3
6	A2MET506	Foundation of Computational Fluid Dynamics	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF ECE						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2ECT501	Principles of Communication Engineering	3	-	-	3
2	A2ECT502	Electronic Instrumentation	3	-	-	3

3	A2ECT503	Biomedical Engineering	3	-	-	3
4	A2ECT504	Modern Communication Systems	3	-	-	3
5	A2ECT505	Transducers and Sensors	3	-	-	3
6	A2ECT506	Principles of Mobile Communications	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CSE & IT						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CIT501	Fundamentals of Data Structures	3	-	-	3
2	A2CIT502	Object Oriented Programming with JAVA	3	-	-	3
3	A2CIT503	Web Design and Development	3	-	-	3
4	A2CIT504	Python Programming	3	-	-	3
5	A2CIT505	NoSQL Databases	3	-	-	3
6	A2CIT506	Data Analytics	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CHEMICAL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CHT501	Computational Fluid Dynamics	3	-	-	3
2	A2CHT502	Non-Conventional Sources of Energy	3	-	-	3
3	A2CHT503	Design & Analysis of Experiments	3	-	-	3
4	A2CHT504	Industrial Waste Water Engineering	3	-	-	3
5	A2CHT505	Green Chemistry & Technology	3	-	-	3
6	A2CHT506	Air Pollution Control and Design of Equipment	3	-	-	3

A2MAT101	SEMESTER - I	L	T	P	C
	MATHEMATICS-I (common to ALL branches)	3	1	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: LINEAR ALGEBRA-1

Rank of a matrix: Elementary row and column transformations, equivalent matrices, Echelon form of a matrix, calculation of rank by reducing the matrix to Echelon form. System of equations: Linear system of equations, homogeneous and non-homogeneous system of equations, consistency criteria, trivial and non-trivial solutions, solving system of equations by Rank method; Eigenvalues and Eigenvectors: Finding Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors (statements) including spectral mapping theorem.

UNIT- II: LINEAR ALGEBRA-2

Cayley-Hamilton Theorem: Statement of the theorem and its verification. Applications: Finding higher powers of a matrix, finding matrix polynomials, finding inverse of matrix. Diagonal form of a matrix: Reduction to diagonal form, spectral and modal matrices, finding higher powers of a matrix using diagonalisation, Quadratic forms: Matrix form of quadratic forms, orthogonal transformation, canonical form, reduction of quadratic form to canonical form by orthogonal transformation method, rank, index, signature and nature (definiteness) of a quadratic form.

UNIT-III: FIRST ORDER DIFFERENTIAL EQUATIONS & APPLICATIONS

Outlines: Differential Equations(DEs), Order and degree of a DE, Formation of DEs, general solutions of a DE; Solving first order and first degree DEs: linear DEs, Bernoulli's DEs (reducible to linear), exact DEs, integrating factors, non-exact DEs (reducible to exact).

Applications to real world problems: Newton's law of cooling, laws of growth and decay, family of curves, orthogonality of families curves, orthogonal trajectories (Cartesian and polar curves).

UNIT-IV: HIGHER ORDER DIFFERENTIAL EQUATIONS

Differential equations of higher order: Linear differential equations of higher order, its operator form. Solution concepts: General (complete) solution, particular solution. Solution of linear differential equations of higher order: Auxiliary equations, rules for finding complementary functions, rules for finding particular integrals (general and special methods).

UNIT-V: LAPLACE TRANSFORMS

Laplace transformation: Laplace transformation of elementary functions, Properties: Linearity, change of scale, first shifting properties, finding Laplace transformations using properties, Advanced properties: Laplace transformations of derivatives and integrals, multiplication by t^n, division by t (statements), finding Laplace transformations using advanced properties; Inverse Laplace transformations: Finding inverse Laplace transformations using partial fractions, statement of Convolution theorem, finding inverse Laplace transformations by Convolution theorem; Applications: Solving Initial Value Problems by using Laplace transformations.

//Topics prefixed with ‘outlines / overview’ are not for assessment//

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publishers, Revised edition

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

COURSE OUTCOMES: Learners at the end of this course will be able to

CO 1	KO#1	Recall the concepts of Linear algebra
CO 2	KO#2	Recall the solution methods and applicability of first order differential equations
CO 3	KO#3	Recall the solution methods of higher order differential equations and the concepts of Laplace transforms
CO 4	UO#1	Use and interpret the concepts of linear algebra
CO 5	UO#2	Use and interpret solution methods and applicability of first order differential equations
CO 6	UO#3	Use and interpret solution methods of higher order differential equations and the concepts of Laplace transforms
CO 7	AO#1	Apply the concepts of linear algebra, differential equations and Laplace transformation to model and solve real world problems

CO/PO Mapping

Course Title:	Mathematics-I (Common to ALL Branches)													
Course Code:	A2MAT101													
Course Designed by	Dept. of Mathematics													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2PYI102	SEMESTER – I	L	T	P	C
	APPLIED PHYSICS (COMMON TO EEE,ECE, CSE & IT)	3	-	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: WAVE OPTICS [10hrs]

Interference: Introduction- Coherence– Young's double slit experiment- Theory of interference fringes- Interference in thin parallel film by reflection (under reflected light)- Newton's Rings- Applications.

Diffraction: Introduction - Fraunhofer diffraction at- Single slit– Double slit (qualitative)- Diffraction Grating.

Polarization: Introduction– Polarization by refection- Brewsters law- Double refraction– Nicol Prism– Theory of Plane, circular and elliptically polarized light – Quarter wave & Half wave plate

UNIT-II: MAGNETIC PROPERTIES OF MATERIALS [8hrs]

Introduction– Origin of Magnetic moment in atom– Classification of magnetic materials– Ferromagnetism- Weiss theory (qualitative)- Domain theory- Hysteresis- Soft & Hard magnetic materials- Ferrites- Garnets- Applications.

UNIT-III: DIELECTRIC PROPERTIES OF MATERIALS [8hrs]

Introduction– Types of Polarization- Electronic- Ionic- Orientation polarization– Internal field- Clausius Mossoiti relation- Frequency dependency of polarization- Dielectric loss- Loss Tangent- Ferro electricity- Piezoelectricity- P-E loop- Applications.

Unit-IV: HEAT TRANSFER [10hrs]

Transfer of heat energy- conduction, convection and radiation and their fundamental laws. Thermal expansion of solids and liquids - expansion joints -bimetallic strips. Heat conductions in solids- thermal conductivity - Forbe's and Lee's disc method: theory and experiment - applications (qualitative). Working principles of heat exchangers- refrigerators- ovens- solar water heaters.

UNIT–V: QUANTUM PHYSICS & SEMICONDUCTORS [12hrs]

Quantum Physics: Introduction- Matter wave– Davisson Germer Experiment- Schrodinger's wave equations– Wave function– Particle in potential box– Origin of energy bands.

Introduction- Intrinsic semiconductors– Carrier concentration (qualitative)– Electrical conductivity- Extrinsic semiconductors– Carrier concentration (qualitative)- Drift and Diffusion currents- Direct and Indirect band gap semiconductors- Light emitting diode– Solar cell- Hall effect- Applications.

TEXTBOOKS:

1. R.K.GAUR and S.L.GUPTA, Engineering Physics, Dhanpat Rai Publications

REFERENCES:

1. RESNICK, HALLIDAY and WALKER, Principles of Physics, Wiley Publishers
2. P.K. NAG, Heat and Mass Transfer, Mc Graw Hill Publishers.
3. B.K. PANDEY and S. CHATURVEDI, Engineering Physics, Cengage Learning Publishers.

COURSE OUTCOMES:

CO1. Student will be able to gain knowledge on basics of interference, diffraction and polarization of light.

CO2. Student will be able to gain knowledge on fundamentals of magnetic properties of materials and the polarization mechanisms of dielectrics.

CO3. Student will be able to gain knowledge on modes of heat transfer and the essentials of quantum physics & semiconductors for engineers.

CO4. The students will be able to understand and recognize the principle behind working of optical devices.

CO5. The students will be able to understand and recognize the underlying property behind working of electric and magnetic components in devices.

CO6. The students will be able to understand and recognize the importance of heat transfer and quantum mechanics based semiconductor devices.

CO7. The students will have the ability to apply the conceptual knowledge of principles of quantum physics in designing and developing engineering applications.

CO/PO MAPPING:

Course Title:	Applied Physics (Common to ECE, CSE & IT Branches)													
Course Code:	A2PYI102													
Course Designed by	Dept. of Physics													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1				1		
CO2	3	3						1				1		
CO3	3	3						1				1		
CO4	3	3						1				1		
CO5	3	3						1				1		
CO6	3	3						1				1		
CO7	3	3						1				1		

Course designed by	DEPARTMENT OF PHYSICS
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2PYI102	SEMESTER – I	L	T	P	C
	APPLIED PHYSICS LAB (COMMON TO EEE,ECE, CSE & IT)	-	-	3	2
	Total Contact Hours – 42				

LIST OF EXPERIMENTS

1.	Determination of the radius of curvature of the plano-convex lens by Newton's Rings method.
2.	Determination of the thickness of the thin object (hair/paper) by Wedge method.
3.	Determination of the prominent spectral line wavelengths in mercury spectrum by normal incidence method.
4.	Obtain the signature variation of the axial magnetic field for a circular coil carrying current.
5.	Estimation of the hysteresis loss for a ferromagnetic material.
6.	Determination of thermal conductivity coefficient of the disc shaped material.
7.	Determination of energy band gap of the semiconductor by using junction diode.
8.	To plot I/V Characteristics of Zener diode.
9.	Determination of temperature coefficient of the thermistor.
10.	To plot frequency response characteristics of the L.C.R series circuit.

TEXTBOOKS:

1. BALASUBRAMANIAN.S, SRINIVASAN.M..N, A Text book of Practical Physics, S Chand Publishers, 2017

REFERENCES:

1. https://vlab.amrita.edu.

COURSE OUTCOMES:

CO1. Design experiments to demonstrate and investigate the interference and diffraction patterns of light.

CO2. Design experiments for signature variation of magnetic field due to current and the hysteresis loss in magnetic materials.

CO3. Design experiment to determine the thermal conductivity coefficient (*K*) of a material.

CO4. Design L.C.R series circuits for desired applications based on their frequency response characteristics.

CO5. Design experiments for determining the physiognomies of the semiconductor devices like the energy band gap, breakdown voltage and coefficient of resistance.

CO/PO MAPPING:

Course Title:				Applied Physics Lab (Common to ECE, CSE & IT Branches)										
Course Code:				A2PYI102										
Course Designed by				Dept. of Physics										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1	2	1		1		
CO2	3	3						1	2	1		1		
CO3	3	3						1	2	1		1		
CO4	3	3						1	2	1		1		
CO5	3	3						1	2	1		1		

Course designed by	DEPARTMENT OF PHYSICS
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CII201	SEMESTER – I	L	T	P	C
	PROGRAMMING FOR PROBLEM SOLVING	3	1	3	5
	Total Contact Hours : 54				
	Prerequisites: Mathematics				

COURSE OBJECTIVES

COBJ1.	Students will study systematic approach to problem solution specification using finite number of unambiguous steps.
COBJ2.	Students will gain understanding of procedural language features using C as the template.
COBJ3.	Students will read and analyse alternative construct choices in procedural language C.
COBJ4.	Students will get exposure to systematic approach of automated solution design, implementation and testing using a procedural language.

SYLLABUS

UNIT – I: [9 HOURS]

INTRODUCTION: Introduction to Programming, Computer System, Hardware and Software concepts.

PROBLEM SOLVING: Algorithm, Pseudo-code, flow-chart, program development steps, high-level, Assembly and machine languages.

BASICS OF C PROGRAMMING: Structure of C program, identifier, basic data types and sizes, constants, variables, arithmetic operators, relational operators, logical operators, increment and decrement operators, assignment operator, conditional operator, scanf and printf built-in functions, Creating and running programs.

UNIT – II: [9 HOURS]

BIT-WISE OPERATORS: logical, shift, rotation, masks.

EXPRESSIONS: expressions, type conversions, conditional expressions, precedence and order of evaluation.

SELECTION: Two-way selection: if-else, nested if, examples, multi-way selection: switch, else-if, examples.

ITERATIVE: loops - while, do-while and for statements, break continue, event and counter controlled loops.

UNIT – III: [18 HOURS]

Part – I: [9 HOURS]

ARRAYS: Arrays (1-D, 2-D), Character arrays and Strings, Searching (Linear Search and Binary Search).

Part – II: [9 HOURS]

BASIC ALGORITHMS: Basic Sorting Algorithms (Bubble, Insertion and Selection), comparing algorithms for complexity.

FUNCTIONS: Functions, Scope and Extent of Variables, Function Parameters, parameter passing using call-by-value, sub-routines, Storage Classes,#define,#ifdef, #ifndef pre-processor directives.

UNIT – IV: [9 HOURS]

RECURSION: Definition of Recursion, example programs using recursion like finding Factorial, Fibonacci series, Quick sort, puzzle solving using recursive functions (towers of hanoi, ackerman function).

POINTERS: Definition of Pointers, Pointer Type, Pointer Arithmetic, Function parameter passing using call-by-reference.

MEMORY ALLOCATION: Difference between static and dynamic memory allocation, dynamic memory allocation using built-in functions, dangling pointer, unreferenced memory problem.

UNIT – V: [9 HOURS]

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, concept of linked list, program applications.

FILE-HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, command line arguments.

Suggested Text Books

1. Programming For Problem Solving, Behrouz A.Forouzan & Richard F.Gilberg, Cengage Publishers, 3rd Edition
2. Programming In C:A Practical Approach, Ajay Mittal, Pearson Education

Suggested Reference Books

1. Brian W. Kernighan And Dennis M. Ritchie, The C Programming Language, Prentice Hall Of India
2. Introduction To C Programming, Reema Thareja, Oxford University Press
3. E. Balaguruswamy, Programming In Ansi C, Tata Mcgraw-Hill

COURSE OUTCOMES

The student will

1. Have the ability to **describe** a formal algorithmic solution for the given problem, **list** the features of C including scalar & vector data types, operators, **Outline** expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.

2. Have the ability to **describe** one and two-dimensional arrays, **outline** loops and arrays for searching and **describe** various sorting techniques.

3. Have the ability to **outline** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Describe** command like arguments, structures, unions, and enumeration. Have knowledge of handling files.

4. Have the ability to **solve** complex expressions, **design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control & iterative statements, and arrays.

5. Have the ability to **apply** arrays to solve complex matrix related problems and strings. **Compare and contrast** various searching and sorting techniques for complexity.
6. Have the ability to **distinguish between** function call types. **Draw inferences on** command line arguments, storage classes, and pre-processor directives. **Use** pointers with functions, arrays, strings, to **solve** complex problems. **Give example** and **solve** classical recursion problems**. Compare and contrast** static and dynamic memory allocation, and **apply** them. **Use** structures and unions to implement and **solve** real-time problems. **Apply** file related functions to process files.

7. Have the ability to **Fully appreciate** the art of procedural programming in C and develop programs **optimally** using the full feature set of C language.

Course Title:	Programming for problem solving (Common to ALL Branches)														
Course Code:	A2CIT201														
Course Designed by	Dept. of Computer Science and Engineering														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOM	PSON	PSOO
CO1	3	3						3	2	1		2	1	1	1
CO2	3	3						3	2	1		2	1	1	1
CO3	3	3						3	2	1		2	1	1	1
CO4	3	3	3	3	3	3	3	3	2	1	1	2	3	3	3
CO5	3	3	3	3	3	3	3	3	2	1	1	2	3	3	3
CO6	3	3	3	3	3	3	3	3	3	1	1	2	3	3	3
CO7	3	3	3	3	3	3	3	3	3	1	1	3	3	3	3

Levels of Correlation: High-3, Medium-2, Low-1

PROGRAMMING FOR PROBLEM SOLVING PRACTICE

COURSE OBJECTIVES	
1.	To use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
2.	To implement control flows construct in C Programming Language and understand the syntax, semantics and usability contexts of these different construct.
3.	To develop composite data types in C and constructs available to develop their data-types, utilize them to model things and dealing with data from and to external files.
4.	To design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

UNIT – I

WEEK 1:

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using computers

Lab1: Familiarization with programming environment

i) Exposure to Turbo C, gcc, Code Blocks IDE
ii) Writing simple programs using printf(), scanf()

WEEK 2:

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments/Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts

Lab1: Converting algorithms/flowcharts into C Source code

Developing the algorithms/flowcharts for the following sample programs

i. Sum and average of 3 numbers
ii. Conversion of Fahrenheit to Celsius and vice versa
iii. Simple interest calculation

WEEK 3:

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT – II

WEEK 4:

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and their precedence and associativity:

Lab 4: Simple computational problems using the operator's precedence and associativity

i) Evaluate the following expressions
   a. A+B*C+(D*E)+F*G
   b. A/B*C-B+A*D/3

ii) a. A+++B---A
   b. J=(i++)+(++i)

iii) Find the maximum of three numbers using conditional operator

iv) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5:

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures

i) Write a C program to find the max and min of four numbers using if-else

ii) Write a C program to generate electricity bill

iii) Find the roots of the quadratic equation

iv) Write a C program to simulate a calculator using switch case

v) Write a C program to find the given year is a leap year or not

WEEK 6:

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops:

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop

ii) Find the given number is a prime or not

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers

UNIT – III

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1D Arrays: searching

Lab 7: 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array
ii) Perform linear search on1D array
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number
v) Eliminate duplicate elements in an array

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2D arrays, Sorting and Strings

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT-IV

WEEK 9:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 9: Functions, call by value, scope and extent,

Lab 9: Simple functions using call by value, Solving differential equations using Eulers theorem

i) Write a C function to calculate NCR value
ii) Write a C function to find the length of a string
iii) Write a C function to transpose of a matrix
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 10:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems

that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 10: Recursion, the structure of recursive calls
Lab 10: Recursive functions

i) Write a recursive function to generate Fibonacci series
ii) Write a recursive function to find the lcm of two numbers
iii) Write a recursive function to find the factorial of a number
iv) Write a C Program to implement Ackermann function using recursion
v) Write a recursive function to find the sum of series.

WEEK 11:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Suggested Experiments/Activities:
Tutorial 11: Call by reference, dangling pointers
Lab 11: Simple functions using Call by reference, Dangling pointers

i) Write a C program to swap two numbers using call by reference
ii) Demonstrate Dangling pointer problem using a C program
iii) Write a C program to copy one string into another using pointer
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

UNIT – V

WEEK 12:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 12: Pointers, structures and dynamic memory allocation
Lab 12: Pointers and structures, memory dereference

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 13:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly-linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 12: Bitfields**,** Self-Referential Structures, Linked lists
Lab 12: Bitfields, linked lists

i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
ii) Create and display a singly linked list using self-referential structure
iii) Demonstrate the differences between structures and unions using a C program
iv) Write a C program to shift/rotate using bitfields
v) Write a C program to copy one structure variable to another structure of the same type.

WEEK 14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.
Suggested Experiments/Activities:
Tutorial 14: File handling:
Lab 14: File operations

i) Write a C program to write and read text into a file
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file
iv) Write a C program to merge two files into the third file using command-line arguments
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXTBOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

COURSE OUTCOMES

CO1.	**Demonstrate** the ability to write a formal algorithmic solution for the given problem, **name & explain** the features of C like types including scalar & vector types, operators, expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.
CO2.	**Implement** one and two-dimensional arrays to solve simple mathematical and matrix related problems. **Make use of** loops and arrays for searching and **Compare** various sorting techniques.
CO3.	**Identify** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Understand** command like arguments, structures and unions. Have **knowledge** of handling files.
CO4.	**Design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control statements, and arrays.
CO5	**Apply** pointers, functions, derived data types, and dynamic memory allocation, **design** solutions to challenging problems.
CO6	**Illustrate** the art of procedural programming in C and **develop** programs optimally using the full feature set of C language.

Course Title:	Programming for problem solving lab (Common to ALL Branches)
Course Code:	A2CII201
Course Designed by	Dept. of CSE & IT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	3	1	1	1	2	2			2	2	2
CO2	3	3	1	2	3	1	1	1	2	2			2	2	2
CO3	3	3	2	3	3	2	1	1	2	2			3	3	3
CO4	3	3	2	3	3	3	1	1	2	2			3	3	3
CO5	3	3	3	3	3	3	1	1	2	2			3	3	3
CO6	3	3	3	3	3	3	1	1	3	3	3		3	3	3

Levels of Correlation: High-3, Medium-2, Low-1

Course designed by	DEPARTMENTS OF CSE & IT
Approval	Approved by: Meeting of Board of Studies held on 29-06-2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019

A2MED201	SEMESTER - I	L	T	P	C
	COMPUTER AIDED ENGINEERING GRAPHICS	1	-	4	3
	Total Contact Hours – 60				

SYLLABUS

UNIT-I

Overview of Computer Graphics:

Computer technologies that impact on graphical communication, Demonstrating knowledge of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

Set up of the drawing page and the printer, Scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing.

Applying dimensions to objects, applying annotations to drawings;

UNIT-II

Layers: Setting up and use of Layers, layers to create drawings, create, edit and use customized layers, concept of view ports.

Introduction to Orthographic Projections: Projections of Points; Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT-III

Projections of Straight Lines and Planes: Lines inclined to both planes, determination of true lengths, angle of inclinations and traces, Projections of Planes

UNIT-IV

Projections and sections of solids: Projections of simple solids- Sections of solids

UNIT -V

Development of surfaces, Isometric Projection and Conversion of Isometric Views to Orthographic Views: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

TEXT BOOKS

1. DM Kulkarni, AP Rastogi, AK Sarkar "Engineering graphics with Auto CAD" PHI Publishers
2. Bhatt N.D., Panchal V.M. & Ingle P.R "Engineering Drawing" Charotar Publishing House.

REFERENCE BOOKS

1. Shah, M.B. & Rana B.C "Engineering Drawing and Computer Graphics", Pearson Education.
2. Agrawal B. & Agrawal C. M "Engineering Graphics", TMH Publication.
3. Narayana, K.L. & P Kannaiah "Engineering Drawing", SciTech Publishers.
4. CAD Software Theory and User Manuals.

COURSE OUTCOMES

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

CO1: Prepare two dimensional drawings using draw and modify commands in Auto CAD software and represent dimensions to the drawings

CO2: Clearly differentiate different types of projections and get solutions to projections of points in Auto CAD by applying the layers concept

CO3: Solve problems related to projections of straight lines and planes

CO4: Prepare simple solids in CAD software and obtain solutions to projections and sections of solids

CO5: Develop the surfaces of simple solids, prepare Isometric drawings and convert isometric drawings into orthographic views

CO/PO Mapping

Course Title:	Computer Aided Engineering Graphics													
Course Code:	A2MED201													
Course Designed by	Dept. of Mechanical Engineering													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		3	1		1	2	3	2	2	3	2
CO2	3	2	2		3	1		1	2	3			2	1
CO3	3	2	2		3	1		1	2	3			2	1
CO4	3	2	3		3	1		1	2	3	2	2	3	1
CO5	3	2	3		3	1		1	2	3	2	2	3	1

Course designed by	DEPARTMENT OF MECHANICAL ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29-06-2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

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A2EHA701	SEMESTER - I	L	T	P	C
	CONSTITUTION OF INDIA	2	-	-	0
	Total Contact Hours – 30				

SYLLABUS

UNIT – I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History - Drafting Committee, (Composition & Working)

UNIT – II: PHILOSOPHY OF THE INDIAN CONSTITUTION: Preamble - Salient Features

UNIT-III: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES: Fundamental Rights -Right to Equality -Right to Freedom -Right against Exploitation -Right to Freedom of Religion -Cultural and Educational Rights -Right to Constitutional Remedies ; Directive Principles of State Policy ; Fundamental Duties.

UNIT-IV: ORGANS OF GOVERNANCE: Parliament -Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers; Judiciary, Appointment and Transfer of Judges, Qualifications.
UNIT – V: LOCAL ADMINISTRATION: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat : Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

TEXT BOOK:
Reference Source compilation

REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

COURSE OUTCOMES:

CO1. Students will be able to discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2. Students will be able discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3. Students will be able to discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO4. Students will be able to discuss the passage of the Hindu Code Bill of 1956.

CO5. Students will be able to discuss the powers of Executive, Judiciary and Legislature.

CO/PO Mapping

Course Title:	Constitution of India (Common to ALL Branches)
Course Code:	A2EHA701
Course Designed by	Dept. of English & Humanities

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2								
CO2						2								
CO3						2								
CO4						2								
CO5						2								

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 23.06.15
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

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A2MAT103	SEMESTER - II	L	T	P	C
	MATHEMATICS-II (CSE & IT)	3	1	0	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: RANDOM VARIABLES & PROBABILITY DISTRIBUTIONS

Random Variables: Discrete and continuous random variables, properties of mass and density functions. Mathematical Expectation: Properties (statements), Moment Generating Function; Outlines: of Binomial and Poission distributions; Normal Distribution: Probability density function, Normal approximation to Binomial Distribution, Parameters of Normal Distribution(statements), Characteristics of normal distribution, Area under normal curve, Standard normal distribution.

UNIT- II: STATISTICAL METHODS

Curve fitting by least squares method: Bi-variate data, scatter diagram, method of least squares, normal equations, fitting of straight line, second degree curve (parabola), exponential and power curves; Correlation: types of correlation, measures of correlation, Karl Pearson coefficient of correlation and its properties; Regression Analysis: Regression Coefficients and its Properties, Regression lines.

UNIT-III: SAMPLING DISTRIBUTIONS AND TESTING OF HYPOTHESIS (LARGE SAMPLES)

Sampling distributions: population, sample, population parameters, sample statistic and types of sampling, sampling distribution of means (with and without replacement), standard error, Testing of hypothesis (large samples): Statistical hypothesis, null hypothesis, alternative hypothesis, type-I and type-II errors, critical region, level of significance, one tailed and two tailed tests.

Large Sample tests: Z-test for single mean and difference of means, single proportion and difference of proportions.

UNIT-IV: TESTING OF HYPOTHESIS (SMALL SAMPLES)

Testing of hypothesis (small samples): Introduction to small sample tests, degrees of freedom, Student's t, F and Chi-square distributions; student's t-test: t-test for single mean, difference of means and paired t-test; Chi-square test: Goodness of fit, independence of attributes, F-test: equality of population variances.

UNIT-V: QUEUING THEORY

Introduction to Queuing Models: Introduction to stochastic process, states space, Markovian's property, Input pattern, service pattern, queue discipline, Queue behavior, Kendal's notation, Pure Birth and Death Models, Traffic intensity; (M/M/1: ∞/FIFO)-Model: Average System length, Average queue length , Average waiting time and related probabilities; (M/M/: N/FIFO)-Model: Average system length, average queue length, average waiting time and related probabilities.

//Topics prefixed with 'outlines / overview' are not for assessment//

TEXT BOOKS:

1. RE Walpole, SL Mayeres & K May, Probability and Statistics for Engineers & Scientists, 3/e, Pearson Publishers
2. T.K.V. Iyengar et al, Probability and Statistics, S. Chand Publications, Revised edition.

REFERENCE BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. Murugesan and Gurusamy, Probability, Statistics and Random Process, Anuradha Publicatons.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

COURSE OUTCOMES:

At the end of course, students shall be able to:

CO 1 Recall the concepts of random variables, probability distributions and statistical methods.

CO 2 Recall the concepts of Sampling distributions and testing of hypothesis (large samples).

CO 3 Recall the concepts of testing of hypothesis (small samples), stochastic processes and queuing models.

CO 4 Understand and interpret the concepts of random variables, probability distributions and statistical methods.

CO 5 Understand and interpret the concepts of Sampling distributions and testing of hypothesis (large samples).

CO 6 Understand and interpret the concepts of testing of hypothesis (small samples), stochastic processes and queuing models.

CO 7 Apply the tools of probability and statistics to real world problems.

CO/PO Mapping

Course Title:	MATHEMATICS-II (CSE & IT)													
Course Code:	A2MAT103													
Course Designed by	Dept. of Mathematics													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CYI101	**SEMESTER - II**	**L**	**T**	**P**	**C**
	ENGINEERING CHEMISTRY (Common to all branches)	**3**	**1**	**3**	**5**
	Total Contact Hours – 48				

SYLLABUS

UNIT 1: WATER TECHNOLOGY

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT 2: POLYMERS

Introduction to polymers, functionality of monomers, addition and condensation polymerization, copolymerization, stereospecific polymerization with specific examples. Thermoplastics and Thermo-sets – their differences.

Elastomers – applications with specific examples- Preparation, properties and uses of PVC, Bakelite, Teflon and Nylon-6, 6, Buna-S and Thiokol rubber- Fibre reinforced plastics – carbon fibre, glass fibre and aramids.

UNIT 3: ELECTROCHEMISTRY AND APPLICATIONS

Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.
Primary cells –dry cell- Secondary cells – lead acid, nickel-cadmium and lithium ion batteries- working of the batteries including cell reactions- Fuel cells, hydrogen-oxygen, and methanol fuel cells – working of the cells.
Corrosion: Introduction to corrosion, mechanism of dry and wet corrosion, Pilling Bedworth ratios and uses, Types of corrosion – Differential aeration corrosion, galvanic corrosion, pitting corrosion, waterline corrosion and stress corrosion, Factors affecting the rate of corrosion – metal based factors and environmental based factors, protection techniques – metal coatings – galvanization and tinning, cathodic protection, inhibitors – cathodic and anodic, organic coatings – paints – constituents and their functions.

UNIT-4: CHEMISTRY OF ADVANCED MATERIALS

NANOMATERIALS: introduction- synthesis of Nano material by sol gel method- CVD- engineering applications of Nano materials
CEMENT: Introduction to ordinary Portland cement- manufacturing of OPC- setting and hardening of cement- decay of cement.
FUELS: Introduction- classification- liquid fuels- cracking- knocking- octane number and cetane number; Lubricants- definition- mechanism and properties of lubricants

UNIT 5: INSTRUMENTAL METHODS AND APPLICATIONS

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle, instrumentation (Block diagram and working), applications of UV, IR and NMR spectroscopic methods. Chromatography- introduction- Ion exchange chromatography- applications

COURSE OUTCOMES:

CO1: The student will have the ability to describe softening methods and desalination processes. He/ She will be able to explain various types of polymers; preparation, properties and engineering applications of thermoplastic, thermosetting plastics, rubbers and FRP's.

CO2: The student will have the ability to describe electrochemical reactions, principles of batteries, fuel cell and corrosion.

CO3: The student will have the ability to outline electromagnetic spectrum and explain the working principles of IR, UV, NMR and chromatographic techniques. The student describes the synthesis, properties and applications of nanomaterials, cement. HE/ She Outlines the cracking methods, knocking of fuels.

CO4: The student will have the ability to differentiate between hard and soft water, demineralization and deionization processes and thermosetting – thermoplastic materials.

CO5: The students will have the ability to give examples on primary and secondary batteries, various types of corrosion, methods of corrosion prevention.

CO6: The student will have the ability to draw inferences on the principles and applications of various instrumental methods and also can compare and contrast between cracking methods.

CO7: The student will have the ability to analyze water samples and validate the results obtained and apply their knowledge on polymers, batteries, materials and instrumentation.

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Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

Reference books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. H.Kaur, Instrumental Methods of chemical analysis, Pragathi Prakashan, 2012.
3. Chemistry for Engineers, Teh Fu Yen, Imperial college press, London

CO/PO Mapping

Course Title:	Engineering Chemistry													
Course Code:	A2CYI101													
Course Designed by	Dept. of Chemistry													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								2			1		
CO2	3								2			1		
CO3	3								2			1		
CO4	3								2			1		
CO5	3								2			1		
CO6	3								2			1		
CO7	3								2			1		

Course designed by	DEPARTMENT OF CHEMISTRY
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

Engineering Chemistry - Laboratory

List of Experiments:

1. Determination of HCl using sodium carbonate
2. Determination of Hardness of a groundwater sample.
3. pH metric titration of strong acid vs. strong base
4. Condcutometric titration of Strong acid VS Strong base
5. Condcutometric titration of Weak acid VS strong base
6. Potentiometric titration of Fe(II) with potassium dichromate
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer
9. Determination of viscosity of polymer solution using survismeter
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of Calcium oxide in port land Cement
12. Preparation of Nanomaterials (ex: Fe/ Zn/ Ferrite)
13. Adsorption of acetic acid by charcoal
14. Determination of acid value and saponification value of a given lubricant
15. Project based learning (Mandatory for all students)

Course Outcomes:

CO1: The student will be able to determine total hardness, strength of acid in a lead acid battery, calcium in Portland cement using volumetric analysis

CO2: The student will be able to explain condcutometric, potentiometric, pH metric titrations and colorimetric determination.

CO3: The student will be able to explain the synthesis of a polymer, nanomaterials

CO/PO Mapping

Course Title:	Engineering Chemistry													
Course Code:	A2CYI101													
Course Designed by	Dept. of Chemistry													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1			1				1	1	2		
CO2	3		1			1				1	1	1		
CO3	3		1							1	1	1		

Course designed by	DEPARTMENT OF CHEMISTRY
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

	SEMESTER – II	L	T	P	C
A2EEI201	**Basic Electrical Engineering (Common to all braches)**	**3**	**1**	**3**	**5**
	Total Contact Hours – 50				

SYLLABUS

UNIT 1: D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin's and Norton's Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT 2: A.C. CIRCUITS

Representation of sinusoidal waveforms, Average and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits (Series & Parallel), Resonance, Three-phase balanced circuits, voltage and current relations in star and delta configurations.

UNIT 3: DC & AC MACHINES [ELEMENTARY TREATMENT ONLY]

Principle and operation of DC Generator - EMF equation – open circuit characteristic of DC shunt generator – principle and operation of DC Motor – Types of DC Motors – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of single-phase Transformer - OC and SC tests on transformer - principle and operation of single phase & Three phase Induction Motors, construction and working of synchronous motors

UNIT 4: BASICS OF POWER SYSTEMS:

Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

UNIT 5: ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Characteristics of Batteries. Elementary calculations for energy consumption, power factor improvement, battery backup.

TEXT BOOK/ REFERENCES:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. Vincent Del Toro, "Electrical Engineering Fundamentals", Pearson, 2015.

COURSE OUTCOMES:

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

CO1. To recall fundamental concepts of electrical circuits such as charge, voltage, current and power.
CO2. Describe the principle of operation of D.C. & A.C. machines.
CO3. Outline the working operation of various generating stations.
CO4. Explain the procedure for solving circuits with A.C and D.C. Excitation
CO5. Summarize the performance characteristics of different machines.
CO6. Explain about different equipment used in power industry
CO7. Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering

CO/PO Mapping

CO / PO mapping	Program Outcomes													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
To recall fundamental concepts of electrical circuits such as charge, voltage, current and power.	3	3	1	1			3			1			1	1
Describe the principle of operation of D.C. & A.C. machines.	3	2	2	2	2					1			1	1
Outline the working operation of various generating stations.	3	3	3	1	1		1			1			1	1
Explain the procedure for solving circuits with A.C and D.C. Excitation	3	3	2	1	1		2			1			1	1
Summarize the performance characteristics of different machines.	3	3	2	1	1	3	1			1			1	1
Explain about different equipment used in power industry	3	3	2	1		2	2			1		1	3	2
Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering	3	3	3	3	3	2	2			2		3	3	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

Basic Electrical Engineering Laboratory

LIST OF EXPERIMENTS

Basic safety precautions, Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.

1. Verification of Kirchhoff laws.
2. Verification of Network Theorems.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. Predetermination of performance parameters of 1 – Phase Transformer.
6. I – V Characteristics of Solar PV cell
7. Brake test on DC Shunt Motor.
8. Measurement of earth resistance.
9. Measurement of reactive power in three phase balanced circuit.
10. Measurement of Choke coil parameters
11. Brake test on 3 - Phase Induction Motor.
12. Determination of AC quantities using CRO/DSO.
13. I – V characteristics of battery.

COURSE OUTCOMES:

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

CO 1. Identify common electrical equipment used in laboratory.(L1)

CO 2. Estimate the ratings of different equipment used to perform an experiment. (L2)

CO 3. Demonstrate the usage of various electrical measuring instruments.(L3)

CO 4. Analyze the characteristics of rotating & stationery electrical machines (L4).

CO 5. Interpret the characteristics of PV cell and Battery.(L5)

CO/PO Mapping

CO / PO Mapping	Program Outcomes													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
Identify common electrical equipment used in laboratory.	3		1	1	3	1			3	2	2	2	2	1
Estimate the ratings of different equipment used to perform an experiment.	3	2	3	3	3	2	1		3	3	2	2	2	3
Demonstrate the usage of various electrical measuring instruments.	2	2	2	2	3	1			3	3	1	2	2	1
Analyze the characteristics of rotating & stationery electrical machines.	3	3	3	3	2				3	3		2	3	2
Interpret the characteristics of PV cell and Battery.	3	3	3	3	3		1		3	3	2	2	3	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2EHL001	SEMESTER - II	L	T	P	C
	Essential Communication in English	1	-	3	3
	Total Contact Hours – 60				

SYLLABUS

UNIT – I: BASIC LANGUAGE SKILLS – A REFRESHER

Organs of Speech: Consonant Sounds &Vowel Sounds; Phonemic Transcription; Using a Dictionary to know the Pronunciation of a word

Presenting Oneself: Introducing oneself -Using different expressions in Formal&Informal Contexts.

Reading a News Article: Identifying the key words and their usage; summarizing the information

Word Study & Mind Mapping: Root words–Derivatives; Homonyms, Homographs, Homophones; Synonyms & Antonyms

UNIT – II: RUDIMENTS OF FUNDAMENTAL COMMUNICATION

The World: Listening & watching Documentaries on World famous Places.

Describing People, Places and Life experiences: Physical Description- Describing someone's qualities – Usage of Jargon to present topography.

Short Story Corner: Reading a short story – Understanding the mood and essence – Sharing different perspectives.

Sentence Patterns: Concord – Rules – Common errors in day-day usage

UNIT-III: COMMUNICATION AT PRACTICE

Oratory Skills: Listening to World's Famous Speeches

JAM (Just a Minute) Talk: Format & Delivery Techniques

Nuances of Language: Company Description –Position Description (Formal) – processes like Chocolate Making(Informal)**.**

Types of Sentences – Declarative, Interrogative, Assertive etc.

UNIT-IV: COMMUNICATION THROUGH CONCEPTUAL LEARNING

BBC English: Watching interviews of Famous people.

Dialogue Practice: Situational Dialogues; Structuring a Role Play

New Inventions: Reading about latest technology pertaining to different fields (Source : Science Journals)

Transformation of sentences: Active Voice-Passive Voice**,** Direct & Indirect Speech**,** Degrees of Comparison**,** Simple Compound & Complex Sentences.

UNIT – V: COMMUNICATION THROUGH LIFE SKILLS

Watching Movies for Language Enrichment & Writing Reviews.

Skits: Enacting a Skit on a Social Issue

Reflections: Reading News Paper Editorial columns, Literacy Reviews, Poetry

Presenting an autobiography: Exploring different styles of writing autobiographies and evolving an own style**.**

TEXT BOOK:
Reference Source Compilation by the Department

REFERENCES:
1. **Fundamentals of Technical Communication** by Meenakshi Raman,OUP.
2. **Living English Structure** by W.Stannard Allen, Pearson Publications.
3. **English Made Easy** by Mary Margaret Hosler, Mc Graw Hill.
4.. **English and Communication Skills for Students of Science and Engineering**, by Dhanavel, S.P. Orient Blackswan Ltd.
5. **The Oxford Guide to Writing and Speaking** by John Seely , OUP

COURSE OUTCOMES:

CO1. Student will be able to come to terms with the basic language Skills required to cater to the requirement of the programme undertaken.

CO2. Student will be able to comprehend and analyze the core concepts well.

CO3. Student will be able to gain proficiency in all four skills of Language – Listening, Reading, Speaking and Writing.

CO4. Student will be able to understand the Syntactical and Grammatical Components of English Language and their correct use.

CO5: Student will be able to present his/her ideas confidently in a Professional manner.

CO/PO Mapping

Course Title:	**Essential Communication in English**													
Course Code:	A2EHL001													
Course Designed by	Dept. of English & Humanities													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2	3	3		3		
CO2						2		2	3	3		3		
CO3						2		2	3	3		3		
CO4						2		2	3	3		3		
CO5						2		2	3	3		3		

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CIW201	SEMESTER - II	L	T	P	C
	BASIC IT TOOLS WORKSHOP	0	0	4	2
	Total Contact Hours – 56 Hours (14 Weeks)				
COURSE OBJECTIVES					
COBJ1.	To Introduce the internal parts of a computer, peripherals, I/O ports, connecting cables				
COBJ2.	To Teach basic command line interface commands on Linux				
COBJ3.	To Teach the usage of Internet for productivity and self-paced lifelong learning				
COBJ4.	To Introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools				

UNIT 1: COMPUTER HARDWARE

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Unit Outcomes:

Student should be able to

1. Identify various kinds Computing devices and their components.
2. Identify the different peripherals, ports and connecting cables in a PC.
3. Assemble and disassemble components of a PC

References:

1. Introduction to computer-peter Norton
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
3. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc

UNIT 2: OPERATING SYSTEMS

Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Linux Operating System commands:

- General command syntax
- Basic *help* commands: whatis, man, info
- Filesystem: ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df
- Date and Time: cal, date,
- Filters and Text processing: echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff, tr, ln, grep, fgrep, egrep, sed, awk, find, xargs, tee,
- File compression: tar, compress, uncompress, split, uuencode, uudecode, gzip, gunzip, read, expr, test, ping, ssh
- Miscellaneous: apt-get, vi editor

- Shell I/O redirection and piping, regular expressions, simple shell programs without control structures.
- Search for “20 examples of grep in linux” and practice like this on all the given commands.

https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
https://www.pcsuggest.com/basic-linux-commands/
https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

Unit Outcomes:

Student should be able to:

1. construct a fully functional virtual machine
2. summarize various linux operating system commands

References:

1. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
2. https://zorinos.com/help/
3. https://zorinos.com/help/install-zorin-os/
4. https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/
5. https://clearlinux.org/documentation/clear-linux/get-started/virtual-machine-install/vmw-player-preconf
6. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
7. https://www.pcsuggest.com/basic-linux-commands/
8. https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/

UNIT 3: NETWORKING AND INTERNET

Networking Commands :

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Google search techniques(text based, voice based)
- alexa website traffic statistics
- Email creation and usage
- google hangout/skype/gotomeeting video conferencing
- archive.org for accessing archived resources on the web
- Creating a Digital Profile on LinkedIn, Twitter, Github

Unit Outcomes:

Students should be able to

1. resolve internet connectivity issues
2. secure a computer from cyber threats
3. apply google search techniques
4. create their own digital profile on social media

References:

1. http://www.googleguide.com/advanced_operators_reference.html
2. https://www.alexa.com/find-similar-sites
3. https://www.alexa.com/topsites examine links Global, By Country and By Category
4. Use https://archive.org/ to locate missing links in other sites.

UNIT 4: PRODUCTIVITY TOOLS

Productivity Tools:

- archival and compression tools
- scanning and image editing tools
- photography with digital camera and photo editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Unit Outcomes:

Students should be able to:

1. archive and unarchive data on the file system using relevant compression tools
2. edit photos & images in various formats using photo & image editing tools
3. recognize characters & extract text from scanned images
4. create audio files and podcasts
5. create video tutorials and publishing

References:

1. File Archivers: https://en.wikipedia.org/wiki/File_archiver .
   Comparison of file archivers:
   https://en.wikipedia.org/wiki/Comparison_of_file_archivers
2. Image editing: https://en.wikipedia.org/wiki/Image_editing
   Comparison of raster graphics editors:
   https://en.wikipedia.org/wiki/Comparison_of_raster_graphics_editors
3. Optical Character Recognition:
   https://en.wikipedia.org/wiki/Optical_character_recognition
4. Audio editing software: https://en.wikipedia.org/wiki/Audio_editing_software
   Comparison of free software for audio:
   https://en.wikipedia.org/wiki/Comparison_of_free_software_for_audio
5. Video editing software: https://en.wikipedia.org/wiki/Video_editing_software
   Comparison of video editing software:
   https://en.wikipedia.org/wiki/Comparison_of_video_editing_software
6. Podcast: https://en.wikipedia.org/wiki/Podcast, Screencast:
   https://en.wikipedia.org/wiki/Screencast, Webcast:
   https://en.wikipedia.org/wiki/Webcast

UNIT 5: OFFICE TOOLS

Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud
    - Google Drive
- Document creation and editing text documents in your web browser
    - Google docs
- Handle task lists, create project plans, analyze data with charts and filters
    - Google Sheets

- Create pitch decks, project presentations, training modules
    - Google Slides
- Manage event registrations, create quizzes, analyze responses
    - Google Forms
- Build public sites, internal project hubs
    - Google Sites
- Web-based service providing detailed information about geographical regions and sites around the world. Explore the globe by entering addresses and coordinates
    - Google Maps and Earth
- Online collaboration through cross-platform support
    - Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars.
    - Google Calendar

Unit Outcomes:
Students should be able to:

1. use office tools for documentation
2. build interactive presentations
3. navigate through the globe
4. build websites
5. create quizzes & analyze responses

References:

1. Cloud computing, productivity and collaboration tools, software and products offered by Google:https://en.wikipedia.org/wiki/G_Suite,
2. G Suite Learning Center: https://gsuite.google.com/learning-center/products/#!/

COURSE OUTCOMES

Students should be able to

1. Identify various computing devices and functional parts of a PC by assembly and disassembly
2. Construct a functional virtual machine and summarize various Linux operating system commands
3. List various networking commands and secure an individual PC or a network from cyber threats
4. Apply Google search techniques, create their own digital profile on social media
5. Edit Multimedia using various tools for image, audio and video processing
6. Use office tools for documentation and building interactive presentations
7. Use social networking for information gathering and online collaboration

CO/PO Mapping

Course Title:	**BASIC IT TOOLS WORKSHOP (CSE&IT)**
Course Code:	**A2CIW201**
Course Designed by	Dept. of CSE & IT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2
CO1	2				3						3		3
CO2	2	3			3						3		3
CO3			3		2						3		2
CO4						2				3	3		2
CO5	2				2						3		2
CO6							3		2		3		
CO7			2			3	3	3	3	2	3	3	

Course designed by	DEPARTMENTS OF CSE & IT
Approval	Approved by: Meeting of Board of Studies held on 29-06-2019.
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

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	SEMESTER-III	L	T	P	C
A2MST001	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	3	0	0	3
	Total Contact Hours: 48				
	Prerequisites: Nil				

BROAD OBJECTIVE:

Make the students understand accounting terminologies ,financial statements and policies followed by organization.

COURSE OBJECTIVES

1. To introduce the students to the basic concepts of economics and demand.
2. To make the students aware of theories of production and cost analysis.
3. To explain the different types of markets and pricing policies followed by organizations.
4. To explore different forms of business and the various factors which affects the businesses.
5. To introduce the students to the basic accounting terminologies, financial statements, and Ratio analysis.

SYLLABUS

UNIT I : Managerial Economics & Demand Analysis:

Definition and Nature of Managerial Economics -Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Types, Measurement of price elasticity- Significance of price elasticity - Demand Forecasting: Factors governing demand forecasting, Methods of demand forecasting.

UNIT II: **Production Function and Cost Analysis:**

Production Function – Isoquants and Isocosts, Least Cost Combination of Inputs, Laws of Returns, Economies and Diseconomies of Scale.**Cost Analysis:** Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Book costs. –Break Even Analysis: Managerial Significance and limitations.

UNIT III : Market Structures, Pricing Policies and Business Environment

Market structures: Types of competition – Features of Perfect, Monopoly, Monopolistic, oligopoly Competition.**Pricing Strategies and Methods –** Cost plus pricing, Penetration Pricing and Price Skimming, Two part pricing, Block and Bundle pricing, Peak load pricing.

Business Environment:

Forms of Business Organizations and their features - Sole trader – Partnership – Private Ltd - Public Ltd and Government Company –Sources of capital - Economic – Technological – Socio Cultural – Political & Government environments.

UNIT IV: Basics of Financial Accounting

Financial Accounting : Double-Entry Book Keeping, Basic Accounting terminologies, Classification of Accounts, Accounting Cycle – Journal – Ledger - Preparation of Trial Balance –Pro forma of Final Accounts - Preparation of Final Accounts: Trading Account and Profit and Loss Account, Balance Sheet **(simple problems without adjustments).**

UNIT V: Financial Analysis

Objectives and Need of financial statements analysis, Ratio analysis: Managerial uses of Ratio Analysis - Types of Ratios: **Liquidity Ratios-** Current ratio and Quick ratio. **Solvency Ratios-** Debt to Equity Ratio, Proprietary Ratio and Interest Coverage Ratio. **Activity Ratios-** Inventory Turnover Ratio, Debtors turnover ratio, Creditors turnover ratio - **Profitability Ratios-**Gross and Net Profit Ratio. **(Theoretical Description)**

Course Outcomes:

1. KO#1: Students shall be able to Describe the basic concepts of managerial economics, demand analysis, production function and cost analysis
2. KO#2: Students shall be able to State the different types of market structures, pricing policies. Describe the various factors affecting business environment.
3. KO#3: Students shall be able to Outline the basic concepts of accounting and financial statements analysis.
4. UO#1: Students shall be able to Explain the basic concepts of managerial economics, demand analysis, production function and cost analysis.
5. UO#2: Students shall be able to Compare and Contrast different types of market structures, pricing policies and various factors affecting business environment.
6. UO#3: Students shall be able to Illustrate the basic concepts of accounting and financial statements analysis.
7. AO#1: Students shall be able to Apply and bring to bear the full complement of concepts of Managerial Economics and Financial Analysis to solve a problem in real time business scenario.

Text books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2003.
2. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI
3. John Dean, Managerial Economics, PHI

References:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey&Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui& A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.

6. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson.
7. S.N.Maheswari& S.K. Maheswari, Financial Accounting
8. Raghunatha Reddy &Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. Truet and Truet: Managerial Economics: Analysis, Problems and cases ,Wiley

Course Designed By	Department of MBA
Approval	Approved by: Meeting of Board of Studies held on 11.08.2020
	Ratified by: Meeting of academic council held on 11.07.2020

A2MST002	**SEMESTER – III**	**L**	**T**	**P**	**C**
	Human Resource Development & Organizational Behavior (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Prerequisites: Open mind, Analytical ability				

BROAD OBJECTIVE:

Make students get exposed with concepts and practices related to Human Resource development and organizational behavior aspects.

Course Objectives:

1. Students will get exposure to well-entrenched concepts and practices related to Human Resource Management and development both at a personality level and at a skill level;
2. Students will study and analyze the different approaches to group communication, group working, and conflict resolution frameworks;
3. Students will study and analyze organizational culture and behavioral aspects both from a local organizational perspective and the invariable increased challenges in an international organization;

SYLLABUS

Unit - I: HRM, Selection, Training & Development

Human Resource Management, Selection: Nature & scope of Human Resource Management; Objectives & Functions of Human Resource Management; Selection; Orientation;

Training & Development: Training & Development – Objectives & Importance; Types of Employee Training; Performance Appraisal; Incentives;

Unit – II: Personality and Perception & Motivation

Personality: Personality Definition & Determinants; Key personality traits relevant to work behavior; Personality Types; Contrasting Personality traits, Tolerance to ambiguity & role of personality;

Perception & Motivation: Factors affecting perception; Perception & its application in organization; Introduction to Motivation & Maslow's Hierarchy of Needs; Herzberg two factor theory of Motivation, ERG Theory;

Unit – III: Communication, Groups, Leadership & Conflict Communication:

Elements of Communication; Types of Communication; Functions & Barriers of Communication; Techniques for overcoming barriers of Communication;

Groups: Types of Groups, Reasons for joining Groups; Stages of Group Development; Group Cohesion; Group decision making, types of teams & team building;

Leadership: Styles of Leadership, Theory of Leadership; Leadership style assessment; Theory of Leader effectiveness, model of situation leadership; Inspirational approaches to Leadership;

Conflict: Types of conflict; Conflict process; Conflict Management Techniques; Transactional Analysis;

Unit – IV: Organizational Behavior and Learning Organizational Behavior:

Key elements and basic approaches of Organizational Behavior; Organizational Behavior Concepts needed by Managers; Models of Organizational Behavior - Autocratic and Custodial; Models of Organizational Behavior - Supportive, Collegial, System;
Learning: Learning Process & Factors affecting Learning; Classic Conditioning Theory & Applications; Operant Conditioning & Applications; Cognitive Learning & Social Learning Theories;

Unit – V: Organizational Culture, Change Management & International Organizational Behavior

Organizational Culture: Features of Organizational Culture; Organizational change; Individual resistance to change; Organizational resistance to change;
Change Management & International Organizational Behavior: Overcoming resistance to change; Lewin's model of change; Individual behavior in international organization; Group behavior in international organization;

Text Books:

1. Gary Dessler.0," FUNDAMENTALS OF HUMAN RESOURCE MANAGEMENT", Pearson, Noida, India,2017
2. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Private Limited, New Delhi, 2009

Course Outcomes:

1. **KO#1:** have the ability to outline and describe Human Resource Management & Selection, Training & Development, Personality, and Perception & Motivation;
2. **KO#2:** have the ability to outline and describe Communication, Groups, Leadership, and Conflict;
3. **KO#3:** have the ability to outline and describe Organizational Behavior, Learning, Organizational culture, and International organizational behavior;
4. **UO#1:** have the ability to draw inferences on Human Resource Management & Selection, Training & Development, Personality, and Perception & Motivation;
5. **UO#2:** have the ability to draw inferences on Communication, Groups, Leadership, and Conflict;
6. **UO#3:** have the ability to draw inferences on Organizational Behavior, Learning, Organizational culture, and International organizational behavior;
7. **AO#1:** have the ability to apply and bring to bear the full complement of concepts and practices of Human Resource Management and Organizational Behavior to better appreciate organizational cultures and optimize individual productivity.

Course Designed by	Department of MBA
Approval	Approved by: Meeting of Board of Studies held on 11.08.2020
	Ratified by: Meeting of academic council held on 11.07.2020

A2MAT104	SEMESTER - III	L	T	P	C
	MATHEMATICS-III (common to CSE & IT)	3	0	-	3
	Total Contact Hours – 48				

Syllabus

Unit-I: Mathematical Logic & Statement Calculus **09 Hours**

Statements and Connectives: statements, connectives, compound statements (Formulas), well-formed formulas, truth tables, tautologies, equivalence of formulas, converse, contrapositives & inverse of an implication, duality law, tautological implications; Normal forms: Principal disjunctive and conjunctive normal forms; Statement calculus: Validity of an argument using truth tables and rules of inference, consistency of premises, indirect method of proof.

Unit-II: Predicates & Predicate Calculus **08 Hours**

Predicate calculus: Predicates, statement of functions, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse, valid formulas and equivalences involving quantifiers, rules of inference, theory of inference for predicate calculus

Unit-III: Combinatorics, Set Theory, Posets and Lattices **07 + 07 Hours**

Combinatorics: Principles of counting (product and sum rules), Pigeon hole principle and its applications, Principle of Inclusion-Exclusion and its applications.; Relations: Binary relation, properties, equivalence relation, partition of a set, equivalence classes, compatibility relation, closures of relations: Reflexive, symmetric and transitive closures

Partial ordering: Partial order relation, partially ordered set (poset), chain, representation and associated terminology such as Hasse diagram, least upper bound, greatest lower bound and well ordering; Lattices: Lattice as partially ordered set, Properties: Idempotent, commutative, associative, absorption, isotonic and Distributive and modular inequalities

Unit-IV: Algebraic Structures **09 Hours**

Algebraic Systems (Structures): Binary operation, algebraic structures such as Semi group, Monoid, Group, commutative group with suitable examples, properties satisfied by the algebraic structures and the elements; Special group structures: Sub group and its criteria, order of an element, Cosets, index of sub group, properties of cosets, order of a group, Lagrange's theorem

Unit-V: Recurrence Relations & Generating Functions **08 Hours**

Recurrence Relations: Formation, iterative method of solving recurrence relations, solving homogeneous and non-homogeneous recurrence relations by characteristic roots method; Generating Functions: Generating functions of sequences, calculation of coefficients of expansions, solving recurrence relations by generating functions

//Topics prefixed with 'Outlines' are not for assessment//

Text Books:

TB1 J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to C Sc, Tata McGraw Hill, 1997

TB2 S. Santha and E V Prasad, Mathematical Foundations for Computer Science, CENGAGE Publishers

Reference Books:

RB1 Kenneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.

RB2 Dr. D S Chandrasekharaiah, Mathematical Foundations of Computer Science, Prism Book Pvt Ltd.

RB3 Swapan Kumar Sarkar, Mathematical Foundation of Computer Science, 9th Edition, S Chand Publishers.

Course Outcomes: At the end of the course, students shall be able to

CO 1	KO-1	Recall the concepts of Mathematical logic and statement & predicate calculus
CO 2	KO-2	Recall the concepts of combinatorics, set theory, posets and lattices
CO 3	KO-3	Recall the concepts of algebraic structures, recurrence relations and generating functions
CO 4	UO-1	Use and interpret the concepts of Mathematical logic and statement & predicate calculus
CO 5	UO-2	Use and interpret the concepts of Predicate Calculus, set theory, posets and lattices
CO 6	UO-3	Use and interpret the concepts of algebraic structures, recurrence relations and generating functions
CO 7	AO-1	Apply the concepts of discreet mathematical structures to computer science and engineering

CO/PO Mapping

Course Title:	Mathematics-III (CSE & IT)
Course Code:	A2MAT104
Course Designed by	Dept. of Mathematics

CO	Program Outcome (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3		2							2			
2	3	3		2							2			
3	3	3		2							2			
4	3	3		2							2			
5	3	3		2							2			
6	3	3		2							2			
7	3	3		2							2			

Course Designed by	Dept. of Mathematics
Approval	Approved by Board of Studies (BoS) of Department of Mathematics in its 4th meeting held on 06.07.2019.
	Ratified by Academic Council in its 5th meeting held on 13.07.2019.

A2CIT202	**SEMESTER-III**	**L**	**T**	**P**	**C**
	Design Thinking and Product Innovation	3	0	0	3
	Total Contact Hours : 48 (Total practice hours-24, Estimated theory hours ~ 24 Total (48 hours)				
	Prerequisites: None				

BROAD OBJECTIVE

Make students conversant with the theoretical concepts and tools of design thinking that can be applied to design solution for complex problems and also innovate new products in emerging startups.

COURSE OBJECTIVES

1. Students will understand Design Thinking and various methodologies for new product development
2. Students will understand principles, tools and activities in various phases of Design Thinking
3. Students will study the thought process in designing radically new products in emerging startups
4. Students will be able carry out an end to end case study with their knowledge on Design Thinking

SYLLABUS

UNIT 1: Introduction to Design Thinking

Design Thinking in General: The Concept of Design Thinking; Wicked Problems, The Principles and the mindset of Design Thinking, Generic Phases of Design Thinking process and activities involved in each of the phase, Design Thinking Frameworks.
Design Thinking for New Product Development : Role of Design Thinking in NPD, When to Apply Design Thinking and When Not to, StageGate Vs Lean Vs. Agile methodologies Vs Design Thinking, Design innovation.

UNIT 2: Problem Identification process in Design Thinking

Empathize: Empathize - Goals and methods, Usage of Tools (Design Briefs - Nine Criteria with example), Usage of Tools (Creation of Personas, Illustrative application of Personas), Student Activity on Empathize phase.

Define: Importance of Define Phase, activities, Usage of Tools (Experience Mapping process with example), Usage of Tools (Developing Insights using HMW Questions, question ladder), Student Activity on Define phase.

UNIT 3: Problem Solving Process in Design Thinking, Case Study discussion & implementation

Ideate: Importance of Ideate Phase, 77 Design Heuristics, Diverge Ideas, Converge Ideas Student Activity on Ideate phase

Prototype & Test*:* "A Design Thinking Product Development Framework", What Is a Story? What Is a Prototype?, "Putting It Together—Combining Stories and Prototypes", Employing Stories and Prototypes in Your Process

Case Study Implementation: Case Study - 1 (Problem Identification Processes in Design Thinking), Case Study - 1 (Problem Solving Processes in Design Thinking), Case Study - 2 (Problem Identification Processes in Design Thinking), Case Study - 2 (Problem Solving Processes in Design Thinking)

Student implementing phases of DT towards Problem Solving: Problem Area Identification , Application of Empathize Phase , Application of Empathize Phase,
Case Study Evaluation Phase - 1

UNIT 4: Product Innovation

The Role of Design in Early-Stage Ventures: Introduction: An Emerging Start-up Culture, The Process: Winding from idea to product, Discussion on Case Study, Troubleshooting Common Mistakes

Optimal Design for Radically New Products: Introduction- six ideas and their implementation, Communicate the Challenge Goal toward Radically New Products; Shift Time Frames to Future and Past, Promote an Emerging Technology Focus across the Consumption Chain; Use of Analogical Thinking, Look for Novel Ways to Solve Simple Problems; Leverage More Ideators via Crowd sourcing

UNIT 5: Case Study implementation

Student implementing phases of DT towards Problem Identification & Solving
Application of Define Phase, Application of Define Phase, Case Study Evaluation Phase – 2, Application of Ideate Phase

Student implementing phases of DT towards Problem Identification & Solving
Application of Ideate Phase, Build Prototype, Test the solution, Case Study Evaluation Phase – 3

Textbooks:

1. Design think new product development essentials from the PDMA – Wiley edition
2. Product Design and Development Karl Ulrich (Author), Steven Eppinger –Fifth edition

References:

1. Design Thinking Getting Started Sidney eve Matrix, https://innovationbydesign.pressbooks.com/
2. https://en.wikipedia.org/wiki/Wicked_problem
3. https://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pdf
4. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
5. https://www.interaction-design.org/literature/article/design-thinking-a-quick-overview
6. https://www.designorate.com/measuring-the-impact-of-design-thinking/
7. https://www.mindtheproduct.com/understanding-design-thinking-lean-agile-work-together/
8. https://www.sopheon.com/spiral-development-lean-vs-stage-gate/#:~:text=In%20practice%2C%20lean%20product%20development,is%20completed%20within%20each%20stage.
9. https://medium.com/codomo/what-is-design-innovation-why-you-need-to-know-it-b8d850503b3a
10. https://dschool-old.stanford.edu/groups/k12/wiki/3d994/empathy_map.html
11. https://www.designkit.org/methods/how-might-we
12. https://careerfoundry.com/en/blog/ux-design/what-is-ideation-in-design-thinking / https://www.interaction-design.org/literature/article/stage-3-in-the-design-thinking-process-ideate

Course Outcomes:

1. **KO#1 :** Have the ability to describe various phases of Design Thinking and various tools for Empathizing in Design Thinking.

2. **KO#2 :** Have the ability to describe various tools for Ideation, Prototyping in Design Thinking

3. **KO#3 :** Have the ability to outline the Design process for new Product development in startups and techniques to design Radically New Products.

4. **UO#1 :** Have the ability to give examples for empathize and define phases in Design Thinking

5. **UO#2 :** Have the ability to give examples for Ideation, Prototyping in Design Thinking

6. **UO#3 :** Have the ability to draw inferences on designing Radically New Products in emerging startups.

7. **AO#1 :** Have the ability to apply Design Thinking principles, methodologies, phases and tools to design New/Radically new Process/Service/Product

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: 6th meeting of academic council held on 21.11.2020

A2CIT301	SEMESTER-III	L	T	P	C
	DIGITAL LOGIC DESIGN	3	0	0	3
	Total Contact Hours: 45				
	Prerequisites: Nil				

BROAD OBJECTIVE

Make students conversant with the theoretical concepts and systematic design techniques that can be applied to the design of digital systems.

COURSE OBJECTIVES

1. Students will study basics of number systems, converting between number systems, computing complements, codes for representing decimal numbers.
2. Students will gain an understanding of Boolean algebra, logic gates for implementing basic Boolean operations, and standard forms of representing Boolean expressions and minimization techniques.
3. Students will study concepts of combinational circuits, sequential circuits, registers, and PLAs
4. Students will study sequential circuits, design procedures for registers, design and analysis procedures of sequential circuits and Asynchronous sequential circuits like counters

SYLLABUS:

UNIT – I: Introduction To Digital Systems

Digital systems and Number systems : Whole numbers: Non-decimal to decimal; Whole numbers: Decimal to non-decimal; Fractional Numbers: Non-decimal to decimal; Fractional Numbers: Decimal to non-decimal.

Binary Arithmetic : r's complement and r-1's complement, Signed number representations; Unsigned addition with overflow check, Un-signed subtraction; Signed addition/subtraction with overflow; Weighted and Non-weighted codes, Floating Point Representation

UNIT – II: Boolean Algebra

Boolean Algebra and Logic gates : Huntington's postulates, Duality and Complement**;** Boolean Theorems**;** POS and SOP Canonical and Standard forms, NAND and NOR gates (AND and OR using NAND and NOR) – universal gates**;** Minimization (3 and 4 variables) given min terms or max-terms to Sum of Products, implement using universal gates
Simplification of Boolean functions : Minimization (3 and 4 variables) given min terms or max-terms to Product of sums, implement using universal gates; Minimization (3 and 4 variables) given min-terms and don't cares to SOP or POS; Minimization (3 and 4 variables) given max-terms and don't cares to SOP or POS; Q-M Method of Minimization (prime implicates method)

UNIT – III:

PART 1-Combinational Logic Circuits

Combinational Logic : Half & Full Adders, Half & Full Subtractors; Ripple Adders, Adder/Subtractor using complement method; Decoders & implementing Boolean functions using decoders; Encoders & Priority Encoders

Medium Scale Integration Circuits(MSI) : Multiplexers & implementing Boolean functions using multiplexers; De-Multiplexers, Multiplexer using decoder and tri-state buffers; Magnitude Comparator, carry look-ahead adder; Code Converters

PART 2: **Synchronous Sequential Logic & PLD's**

Sequential Logic : Definition and classification of sequential circuits, Latches: SR latch, S'R' Latch; Latches: S'R' latch with enable, D Latch, Difference between Level Triggering and Edge-Triggering, Positive-edge and Negative-edge, Asynchronous Inputs, Master Slave Flip Flop Design; SR and D Flip-Flop; JK and T Flip Flop

Programmable Logic Design : Implement SR in any other Flip Flop**;** Conversion of D to JK and T Flip Flop**;** PROM and realization, PAL and realization**;** PLA and realization, Comparison between PROM, PLA, PAL

UNIT – IV: Registers, Counters And Variable Counters

Register and Counters : Control Buffer Registers; Universal Shift Register; Serial Transfer, Serial Addition with and without full adder; Binary synchronous up-counter with control, down-counter with control

Variable Counters : Binary synchronous up-counter with parallel load; BCD synchronous counter or any Mod-n synchronous counter; Ripple binary up-counter and Ripple binary down-counter; Ring Counter& Johnson Counter, handling unused states

UNIT – V: Asynchronous Sequential Logic

Introduction to AsynchronousCircuits : Description of Asynchronous circuits, Race Conditions**;** Analysis using Flow table, transition table**;** Critical & Non-Critical Races examples**;** Analysis of SR Latches

Design Procedure : Analysis of circuit without Latches; Analysis of circuit with latches; Design procedure for asynchronous circuits with Latches; Design Procedure for asynchronous circuits without Latches

Text Books:

1. Digital Design, 4th Edition, Morris Mano, Michael D. Ciletti, Pearson.
2. Fundamentals of Logic Design, 5th Edition, Roth, Cengage.

References:

1. Switching and Finite Automata Theory, 3rd Edition, Kohavi, Jha, Cambridge

COURSE OUTCOMES

1. **KO#1**: Have the ability to deal with different number systems and perform basic arithmetic operations, explain in detail Boolean algebra operations, basic gates for implementing various Boolean operations, forms of representing Boolean expressions and minimizing them.
2. **KO#2**: Have the ability to describe, analyze and build combinational and sequential circuits and explore some of the most widely used combinational circuits and Programmable Logic Devices
3. **KO#3**: Have the ability to describe, analyze, and build standard synchronous sequential circuits like registers and counters and also describe the design procedure and issues involved in asynchronous sequential circuits.
4. **UO#1**: Grasp the significance of number systems and Boolean algebra to optimize simple circuits
5. **UO#2**: Grasp the significance of combinational circuit design and how they might be applied for designing circuits for any given problem and grasp the importance of sequential circuits, distinguishing them from combinational circuits
6. **UO#3**: Grasp the significance of Synchronous and Asynchronous sequential circuits and how they might be applied for designing circuits for a given problem.
7. **AO#1**: Fully appreciate the basics of logic design, digital gates to support basic Boolean operations and the process of designing different circuits for required logical functions that have state and no state

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: 6th meeting of academic council held on 21.11.2020

A2CII301	**SEMESTER-III**	**L**	**T**	**P**	**C**
	DATA STRUCTURES	**3**	**0**	**3**	**5**
	Total Contact Hours: 48				
	Prerequisites: Nil				

BROAD OBJECTIVE

Make students conversant with the theoretical concepts and practical knowledge that can be applied in choosing the appropriate Data Structure for a given problem.

COURSE OBJECTIVES

1. Students will study the basic building blocks (data structures) and generic techniques to solve the common problems used in building any software.
2. Students will learn various methods of organizing the data and select right data structures to model the data.
3. Students will get exposure to use data structures such as arrays, linked lists, stacks, queues, trees, graphs for specific problems and to efficiently implement the common data structures.
4. Students will be able to select the appropriate data structures and algorithms to solve the problem at hand.

SYLLABUS

UNIT- I: Introduction To Data Structures, Recursion, Sorting, Contiguous And Non-Contiguous Memory Allocation

Introduction: Data Structures- Introduction, Need for a data structure, Types of Data Structures, Introduction big O Notation, **Recursion** – Introduction, Types of recursion, **Contiguous Memory allocation -** Introduction to Arrays, **Sorting** Organizing elements in an array in sorted order – Merge Sort, Quick Sort.

Non- Contiguous Memory allocation –Introduction to Linked Lists, Representation of Linked List in memory, Types of Linked Lists, Single Linked List Operations – Insertion, Deletion, Traversal/ Search, Circular Linked List – Insertion, Deletion, Traversal/ Search.

UNIT –II: Double Linked List, Applications of Linked List

Double Linked List- Insertion, Deletion, Traversal / Search, Reversal of Single Linked List, Merging of 2 Linked List (Ordered / Unordered)

Applications of Linked List –Sparse Matrix, Polynomial Representation, Addition of 2 Polynomials, Contrast implementation of a list of user names using static and dynamic storage, Comparison of Arrays and Linked List.

UNIT- III:

PART 1: STACKS, QUEUES

Stacks: Introduction to stack data structure, Basic Operations, Implementation of Stack

using array, Implementation of Stack using Linked List, Applications of Stack - Infix to postfix conversion, Evaluating Arithmetic expressions

Queues: Introduction to Queue, Basic Operations, Implementation of Queue using array, Implementation of Queue using Linked List, Circular Queue, Queue using Stacks, Double ended Queues

PART 2: Trees

Trees: Introduction, Types of Trees, Applications of tree, **Binary Tree** – Introduction, Properties, Various ways of representing Binary Tree in memory, Operations on a Binary Tree, Recursive Binary tree traversals, Construction of Binary tree given tree traversals.

Binary Search Trees: Introduction, Operations on Binary Search trees – Creation, Insertion, Deletion (BST), Traversal /Search.

Balanced Binary trees: Introduction, Operation on AVL Trees –Insertion, Deletion (AVL).

UNIT- IV: Graphs

Graphs – Introduction, Types of Graphs, Graph properties, transpose of a Graph, Various ways of representing Graphs in memory, Operations on Graphs – Insertion, Deletion

Graph Algorithms -Traversals/Search – Breadth First and Depth First, Minimum Spanning tree using Prim's algorithm, Minimum Spanning tree using Kruskal's algorithm, Single Source Shortest Distance (Dijkstra's shortest path)

UNIT- V: Heaps And Hashing

Heaps-Introduction to Heap, Types of Heap, Binary Heap -Creation of Heap, Operations – Insertion, Deletion, Heap Sort, Priority Queue
Hashing – Introduction, Types of Hash Functions, Collision Resolution techniques, double hashing, Rehashing

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage.
2. Data structures and algorithm analysis in C, 2nd ed, mark allen Weiss, Pearson.
3. Data Structure with C, Seymour Lipschutz, TMH.

Reference Books:

1. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH.
2. Classic Data Structures, 2/e, Debasis , Sarnanta,PHI,2009.
3. Fundamentals of Data Structure in C, 2le,' Horowitz, Sahni, Anderson Freed, University Press.

COURSE OUTCOMES

1. **KO#1**: Have the ability to state basics operations on data structures and implement recursion ,sorting methods and perform basic operations on Linked Lists (Knowledge)
2. **KO#2**: Have the ability to implement Stacks and Queues, use them in various applications (Knowledge)
3. **KO#3**: Have the ability to implement non-linear data structures like trees and graphs and implement hashing techniques (Knowledge)
4. **UO#1**: Have the ability to compare various sorting techniques and understand the use of various types of Linked Lists(Understanding)
5. **UO#2**: Have the ability to compare Stacks and Queues, and the purpose of using Linear Data Structures(Understanding)
6. **UO#3**: Have the ability to distinguish between the purpose of various non-linear data structures. (Understanding)
7. **AO#1**: Fully appreciate the art of different data structures and applying the knowledge of data structures to various applications. (Applying)

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: 6th meeting of academic council held on 21.11.2020

A2CII302	**SEMESTER-III**	**L**	**T**	**P**	**C**
	Programming with Python (Common to CSE and IT)	2	0	4	4
	Total Contact Hours : 32				
	Prerequisites: PPS Course				

BROAD OBJECTIVE

Make students conversant with the basic python programming concepts that are used for problem solving and design solutions.

COURSE OBJECTIVES

1. Students will study the basic programming constructs (Data types, Calling Functions) and how they make easy to model solutions to real world problems.
2. Students will study looping and reusable programming constructs.
3. Students will study the in-built functionalities of Strings, lists and tuples.
4. Students will study the file operations with suitable constructs so that they can build applications with random file handing functionalities.
5. Students will study sequential and random file handing functionalities.
6. Students will study the basic GUI programming concepts and how they make easy to model solutions to real world problems in better and goals of Python programming language and get to know how and why these goals are important, relevant and realized.

SYLLABUS

UNIT-1 (Basics, Data Types, operators)

Introduction: Data Types, String Literals, Escape Sequences, String Concatenation, Variables and Assignment Statements, Operators, Program Comments and Docstrings. Numeric Data types, Integers, Floating-Point Numbers. Arithmetic Expressions, Using Functions and Modules, Calling Functions: Arguments and Return Values, the math Module, Program Format and Structure, Running a Script from a Terminal Command Prompt.

UNIT-2 (Loops, decision making and Functions)

Loops and Selection: if and if-else Statements, if-else Statements, While loop, range () function, for loop, nested loops, break, continue, program assignments on loops.
Functions: Syntax and basics of function, use of a function, Parameters and arguments in a function local and global scope of variable, return statement, recursive function.

UNIT-3 (Strings, List- processing, Tuples and Dictionaries)

Strings- A String us a sequence, len, Traversal with for loop, String slice, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String Comparison.

Lists- List is a sequence, Lists are mutable, traversing a list, List operations, List slice, List methods, Map filter and reduce, deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.
Tuples- Tuples are immutable, tuples assignment, Tuple as return values, Variable-length argument tuples, Lists and tuples, Dictionaries and Tuples, Sequence of Sequences.
Dictionaries – A Dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and list, Memos, Global Variables.

UNIT-4 (File Handling)

Need of file handling, text input and output - opening a file, writing text to a file, closing a file, writing numbers to a file, reading text from a file, reading numbers from a file, reading multiple items on one line, appending data, seek() function, binary files, reading binary files, accessing and manipulating files and directories on a disk.

UNIT-5 (Graphical User Interfaces, tkinter, breezypythongui)

The Behavior of Terminal-Based Programs and GUI-Based Programs, Event-Driven Programming, Coding Simple GUI-Based Programs, Windows and Window Components, Types of Window Components and Their Attributes, Command Buttons and Responding to Events, Input and Output with Entry Fields, Other Useful GUI Resources, Multi-Line Text Areas, Obtaining Input with Prompter Boxes, Check Buttons.

Textbooks:

1. Kenneth A. Lambert. "Fundamentals of Python: First Programs", 2nd Edition, Publisher: Cengage Learning
2. Ashok Kamthane. "Programming and Problem Solving with Python", Mc Graw Hill Education.

Reference books:

1. Think python- Second Edition: Allen B. Downey.
2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India

COURSE OUTCOMES

1. **KO#1 :** Have the ability to describe basic programming constructs - operators, conditional and looping constructs with reusable mechanisms.
2. **KO#2 :** Have the ability to describe the Strings, lists, tuples and dictionaries.
3. **KO#3 :** Have the ability to do the file operations and GUI programming.
4. **UO#1 :** Have the ability to draw inferences using in-built functions, loops, decision making and functions.
5. **UO#2 :** Have the ability to give examples on strings, lists, tuples and dictionary.
6. **UO#3 :** Have the ability to give examples with basic File operations and GUI programming constructs using 'Python'.
7. **AO#1 :** Have the ability to apply the python programming concepts to solve a problem in the relevant domain.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: 6th meeting of academic council held on 21.11.2020

A2EHA702	SEMESTER – III	L	T	P	C
	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	**2**	**-**	**-**	**0**
	Total Contact Hours – 30				

BROAD OBJECTIVE

Make students understand the thought process, reasoning and holistic life style of Yogic system.

Course Objectives:

- To impart basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.

- To impart holistic lifestyle of Yogic-science and wisdom capsules in Sanskrit literature which is very important in modern society experiencing rapid technological advancements and societal disruptions.

- To focus on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Content

- Basic Structure of Indian Knowledge System

  i) Ashtadasa vidya
  ii) Veda
  iii) Upavedha
  iv) Ayurvedha
  v) Dhanurvedha
  vi) Ghaandravedha
  vii) Vedang
    a. Shiksha,Kalp
    b. Nirutha
    c. Vyakaran
    d. Jyotishya)
  viii) Shastra
    a. Meemamsha
    b. Purana
    c. Tarka Shasthra

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Suggested Text/Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

COURSE OUTCOMES

CO -1: The students will be able to comprehend the concepts of Indian Traditional Knowledge.

CO-2: The Students will be able to connect themselves with Knowledge from the modern scientific perspective.

CO-3: The students will be able to connect the past with the present advancements in Technology.

CO-4: The students will be to come to terms with the holistic health care system.

C0-5: The students will be able to develop critical thinking skills.

C0-6: The students will be able to comprehend the principles enshrined in ancient Sanskrit Literature

CO/PO Mapping

Course Title:	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1						**2**								
CO2						**2**								
CO3						**2**								
CO4						**2**								
CO5						**2**								
C06						**2**								

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 23.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CHT101	SEMESTER - IV	L	T	P	C
	Biology for Engineers	**3**	**0**	**0**	**3**
	Total Contact Hours – 48				

COURSE OBJECTIVES	
1	To understand the biological concepts from an engineering perspective
2	To study the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins
3	To understand about DNA and RNA
4	To understand the process of metabolism
5.	To understand the various applications of industrial enzymes
6.	To understand the importance of industrial microbiology in the current scenario
7.	To understand the importance of microbes and its applications

Syllabus:

UNIT-I:
Introduction: Biology and its applications, Biological classification, Living Organisms: Cells and Cell theory, Cell structure and function.

UNIT-II:
Biochemistry and molecular analysis: Chemical composition of living forms, analysis of Chemical composition, Carbohydrates, Amino acid and proteins, protein synthesis, Nucleic acids, lipids, nature of bonding and qualitative tests.

Unit-IIIA:
Genetics: Transfer of genetic information, Mendelian Law, Mendel's law of inheritance, Gene interaction, multiple allens, chromosome theory of inheritance., linkage, Recombination, Chromosome mapping, Genetic disorders, Nucleic acids, replication of DNA, types of RNA, Transcription, Genetic code, translation and steps in translation.

Unit-IIIB:
Metabolism: Thermodynamics as applied to biological systems. Exothermic and endothermic reactions. Concept of Keq and its relation to standard free energy, Spontaneity. ATP as an energy currency. The breakdown of glucose toCO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions, Concept of Energy charge.

UNIT-IV:
Enzymes and industrial applications: Mode of action of enzymes, properties of enzymes, chemical reactions, factors affecting enzyme activity, Co-factors, importance of enzymes, industrial application of enzymes.

UNIT-V:
Microbiology and Industrial applications: Microorganism, Growth kinetics, culture media, sterilization, Microscopy, application of microbiology, immunology and immunity, Cancer Biology, stem cells.

Course Outcomes:

Students will be able to:

1. Explain the importance of biology in engineering.
2. Identify the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins
3. Know the importance of DNA and RNA
4. Describe the process metabolism
5. Know the various applications of industrial enzymes
6. Know the importance of industrial microbiology in the current scenario.
7. Explain importance of the microbes and its applications.

Text books:

1. Biology for Engineers by Wiley (ISBN: 9781121439931), 1st edition TMH, New Delhi (2019)
2. Suraish kumar G K, Biology for Engineers, Oxford University Press, New Delhi (2019)

References:

1. Campbell, NA and Reece JB, Biology, International edition, 7th edition or later, Benjamin Cummings, New York (2007 or later)
2. Karp, G, Cell and Molecular Biology: Concepts and Experiments, 7th edition, Wiley, New York (2013)

Mapping of POs & COs (Program Outcomes & Course Outcomes)

A2CHT101 Biology for Engineers														
CO / PO mapping	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO-1	2			2				2	2		2	2	2	
CO-2	2												2	
CO-3	2												2	
CO-4	2												2	
CO-5	2												2	
CO-6	2			2				2	2		2	2	2	
CO-7	2												2	

A2CHT101 Biology for Engineers	
Course designed by	Department of Chemical Engineering
Approval	Approved by: Meeting of Board of Studies held on 29th Jun, 2019
	Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020

A2MAT108	SEMESTER - IV	L	T	P	C
	MATHEMATICS-IV (common to CSE & IT)	3	0	-	3
	Total Contact Hours – 48				

Syllabus

Unit-I: Number Theory **09 Hours**

Integers: Properties of Integers, Divisors, Proper and Improper divisors, Composite Integers, Associate Integers, Division Algorithm, Properties of Divisors, LCM & GCD, Properties of LCM & GCD, Construction of GCD from Division Algorithm; Prime Numbers: Prime & composite numbers, properties of prime numbers, relative prime numbers, Euclid's lemma, fundamental theorem of arithmetic, the number of divisors & sum of divisors of a positive number, Euler's Φ function, Perfect number, Fermat's numbers and related properties, bracket functions and its properties.

Unit-II: Theory of Congruence **08 Hours**

Congruence: Definition, basic properties, residue system, congruence classes and its properties; Congruence equations: Criteria for the existence of solutions of congruence equations, solving linear congruencies, solving simultaneous linear congruencies; problems related to linear congruencies, inverse modulo 'm' and its properties; Some special congruencies: Fermat's theorem and problems on Fermat's theorem, Wilson's theorem and problems on Wilson's theorem.

Unit-III: Z-Transforms **07 + 07 Hours**

Z-Transformation: Z-transformation of elementary sequences, recurrence formula, linearity property, Damping rule, change of scale, Shifting u_n to left and right, multiplication by 'n' , division by 'n', initial value theorem and Final value theorem;

Inverse Z- Transformations: Partial fractions method, convolution theorem(statement), Applications: Concept of difference equation, solving difference equations by Z- Transformations.

Unit-IV: Numerical Methods-1 **09 Hours**

Solving Algebraic and Transcendental Equations: Intermediate value theorem (statement), solution concepts, error in solution, measure of accuracy, approximate and exact solutions, Solution methods: Bisection method, Regula-Falsi method and Newton- Raphson Iterative method; Finite differences: Forward, backward and shift operators, relations among operators, Interpolation: Interpolation and extrapolation, data of equal and unequal intervals, Newton's forward and backward Interpolation formulae, Lagrange's interpolation formula, Fitting polynomials to the data by using Newton's and Lagrange's formulae, Inverse Interpolation by Lagrange's formula.

Unit-V: Numerical Methods-2 **08 Hours**

Numerical Integration: Simpson's and Trapezoidal rules, Weddle's and Boole's rules of integrations; Numerical solutions of ordinary differential equations: Concepts of Initial Value Problem, Taylor's series method, Euler's method, Runge - Kutta method of fourth order; Predictor-corrector method: Milne's method to solve initial value problems.

//Topics prefixed with 'Outlines' are not for assessment//

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. Ajay KR Chaudari, Introduction to Number Theory, New Central Book Agency(P) Ltd, 2018

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. S. B. Malik, Basic Number Theory, Vikas Publishing House Pvt Ltd, 2015
3. T.K.V. Iyengar et al , Mathematical Methods, S.Chand Publishers

Course Outcomes (COs): At the end of course, students shall be able to:

CO 1	KO#1	Recall the concepts of Number theory and Theory of congruences
CO 2	KO#2	Recall the concepts of Z-Transforms
CO 3	KO#3	Recall the concepts of Numerical methods
CO 4	UO#1	Use and interpret the concepts of Number theory and theory of congruences
CO 5	UO#2	Use and interpret the concepts of Z-Transforms
CO 6	UO#3	Use and interpret the concepts of Numerical methods
CO 7	AO#1	Apply the concepts of Number theory, Z-transforms and Numerical Methods to model and solve real world problems.

CO/PO Mapping

Course Title:				Mathematics-IV (Common to CSE & IT)										
Course Code:				A2MAT108										
Course Designed by				Dept. of Mathematics										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CIT302	**SEMESTER – IV**	**L**	**T**	**P**	**C**
	Computer Organization & Architecture (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Total Contact Hours: 48				
	Prerequisites: Digital Logic Design, Basic programming				

Broad Objective:

The students will gain an exposure to basic structure of a computer and will analyze the different ways of designing of computers with parallel processing capabilities.

Course Objectives:

1. Students will get exposure to basic structure of a computer, different functional sub-systems of the computer and different architectural models of computer design.
2. Students will study and analyze the different ways of designing arithmetic logic unit; instruction sets, control units that control the computer, memory subsystems and Input Output subsystems of a computer;
3. Students will study and analyze design of computers with parallel processing capabilities and having multi-processors;

SYLLABUS

Unit – I:

Basic Computer Structure: Computer Types and Functional Units; Stored Program Computer and Basic operational Concepts; Bus structures, Common Software, Computer Performance; Floating point representation, Error detection codes; RTL and notations;
Micro Operations: BUS and memory transfers; Arithmetic micro-operations, circuit; Logic Micro-operations, circuit, logical operations applications; Shift micro-operations and circuit; Micro-operation completeness and combined ALU circuit;

Unit – II:

Computer Instruction Set Design: Timing & Control, Special Purpose Registers and sizes; Instruction Cycle, Fetch & Decode; Memory Reference Instructions, Register Reference Instructions; Input-Output Organization, Input-Output Instructions, Interrupt Cycle; Different Organizations of Computer, Stack Organization, Instruction Formats;
Control Unit Design: Addressing Modes, Program Control Instructions and Flags; RISC, CISC, register Overlap Windows; Hard-wired vs. micro-program control, micro-program control concepts; Address sequencing concepts, Address Sequencer Circuit; Vertical and Horizontal formats, micro-operations, Micro-programs examples, control unit circuit;

Unit – III:

Binary Integer Computer Arithmetic: Signed binary addition/subtraction with negative numbers in signed magnitude form; Signed binary addition/subtraction with negative numbers in 2`s complement form; Binary multiplication with negative numbers in signed magnitude form; Binary multiplication with negative numbers in 2`s complement form; Division with negative numbers in signed magnitude form (restoring & non-restoring);

Floating & Decimal Computer Arithmetic: Floating point addition/subtraction with mantissa in signed magnitude form; Floating point multiplication and division with mantissa in signed magnitude form; BCD Adder, 9`s complement circuits; BCD addition/subtraction; BCD multiplication/division;

Memory Types & Main & Cache Memory Design: Different RAM and ROMs; Associative Memory; Memory Hierarchy and criteria for building hierarchy; Cache Memory Concepts, Direct Mapping Method; Cache Memory, Associative and Set-Associative Mapping;

Virtual Memory Design: Virtual Memory concepts, Segmentation; Paging concepts, Page replacement algorithms, pre-paging and demand paging; Paged segmentation and 2-level mapping; RAID; Page replacement and cache performance problems;

Unit – IV:

I/O Interface & Modes of Transfer: Peripheral devices and Input / Output Interface; Serial and Parallel I/O interface, isolated/memory mapped I/O; Asynchronous data transfer, Strobe Control; Handshaking mode of transfer, Program Controlled I/O; Interrupt Driven I/O, Priority Interrupts;

Direct Memory Access & I/O Processors: Types of Interrupts, Interrupt – Initial and Final Operations, Cycle; **Direct Memory Access;** Serial communication protocols, padding; I/O Processors, RS232, USB; IEEE 1394, PCI Bus;

Unit – V:

Pipelining: Parallel processing basics, Flynn's classification; Pipelining, parameters and Performance Measurement; Arithmetic Pipeline, Instruction Pipeline; Pipeline issues and possible solutions; RISC and RISC Instruction Pipeline;

Vector Processing & Multiprocessors: Vector Processing, memory inter-leaving, super-scalar processors; Array Processors, Characteristics of Multiprocessors; Interconnection Structures; Cache Coherence and solutions; Inter-process Arbitration/synchronization, shared memory multiprocessors and multi-computers;

Text Book:

1. Computer System Architecture, M. Morris Mano, 3rd Edition, Pearson/PHI

Reference Books:

2. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill
2. Computer Architecture, A quantitative Approach, John L. Hennessy and David A. Patterson, 4thEdition , Elsevier

Course Outcomes:

The students will:

1. **KO#1:** have the ability to outline and describe Basic Computer Structure, Micro Operations, Computer Instruction Set Design, and Control Unit Design;
2. **KO#2:** have the ability to outline and describe Binary Integer Computer Arithmetic, Floating & Decimal Computer Arithmetic, Memory Types & Main & Cache Memory Design, and Virtual Memory Design;
3. **KO#3:** have the ability to outline and describe **I**/O Interface & Modes of Transfer, Direct Memory Access & I/O Processors, Pipelining, and Vector Processing & Multiprocessors;
4. **UO#1:** have the ability to draw inferences on Basic Computer Structure, Micro Operations, Computer Instruction Set Design, and Control Unit Design;
5. **UO#2:** have the ability to draw inferences on Binary Integer Computer Arithmetic, Floating & Decimal Computer Arithmetic, Memory Types & Main & Cache Memory Design, and Virtual Memory Design;
6. **UO#3:** have the ability to draw inferences on **I**/O Interface & Modes of Transfer, Direct Memory Access & I/O Processors, Pipelining, and Vector Processing & Multiprocessors;
7. **AO#1:** have the ability to apply and bring to bear the full complement of concepts of Computer organization and architecture design to address a problem in the relevant domain.

Course Designed By	Department of CSE and IT
Approval	Approved By: Meeting of Board of Studies held on 29.08.2020
	Ratified By: 6th meeting of academic council held on 21.11.2020

A2CIT303	SEMESTER – IV	L	T	P	C
	Queuing Theory & Modeling (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Prerequisites: Basic matrix calculations, Basic Probability				

Broad Objective:
The student will have the ability to understand the basic optimization techniques and analyze how these techniques will help to solve the real world engineering problems.

Course Objectives:

1. Students will get exposure to basic optimization techniques in Mathematics and how these techniques will be used to solve real world problems.
2. Students will study and analyze the different techniques to solve the Optimization problems in engineering solutions.
3. Students will study how to mathematically model real life problems and analyze how to solve those problems.

SYLLABUS

Unit – I:

Linear Programming I: Introduction, Formulation of LP, Assumptions for solving LP, Applications of LP, Graphical method of solving LP.

Simplex Method: Steps in solving problems using simplex method, Computational Procedure of Simplex Method, Solutions by simplex method, Disadvantages of Simplex Method.

Unit – II:

Artificial Variable Techniques (Big M method): Introduction to Artificial Variables, Formulation of LP problem with artificial variables, Big-M Method, Disadvantages of Big-M method, Introduction to Artificial Variables, Formulation of LP problem with artificial variables, Big-M Method, Disadvantages of Big-M method.

Degeneracy Problem and Special case solutions of LP problem: Degeneracy Problem, Alternative optimum Solutions, Unbounded Solutions, Non-Existing Feasible Solutions.

Unit – III:

Transportation Problem: Introduction to Transportation problem, Mathematical Formulation of Transportation problem, Matrix formulation, Initial Basic Feasible solutions: North-west corner, Row minima, Column-minima, Lowest Cost Entry method, Vogel's approximation. Moving towards Optimality: (U,V) method.

Assignment Problem: Introduction to assignment problem, Mathematical Formulation of Assignment Problem, Hungarian Method for assignment problem, Examples, Solving Travelling-Salesman Problem as an assignment problem.

Information Theory: Introduction, Communication process & Model, Fundamental Theorem of Information Theory, A measure of Information, A measure of Uncertainty: Entropy; properties of entropy, Problems.

Unit – IV:

Job Sequencing: Introduction and Principal assumptions, Johnson's algorithm for solving n jobs and 2 machines, Processing n jobs through 3 machines, Graphical Methods for processing 2 jobs through m machines.

Theory of Games: Introduction to Game theory, Characteristics of Game theory, Minimax Criterion and optimal strategy, saddle point, optimal strategies and the value of the game, Solution of games with saddle point(s), Fundamental Theorem of Game Theory, Rectangular games without saddle point, Two-by-two games without saddle point.

Unit – V:

Markov Analysis: Introduction, Stochastic process, Transition probability, Transition probability matrix, n-step transition probabilities, Markov Chain, Markov Analysis, Examples.

Simulation: Introduction, Types of Simulation, Limitations of Simulation technique, Phases of simulation model, Generation of Random Numbers, Monte-Carlo Estimation, Applications to: Inventory Control, Queuing Problems, Capital Budgeting, Financial Planning. Advantages and Disadvantages of simulation.

Text Books:

1. Operation Research by S.D Sharma, Kedar Nath Ram Nath &Co.
2. Operation Research by Dr.S.Cheema.

Reference Book:

1. Operation Research by Hamdy A.Taha, 10th edition, 2017.

Course Outcomes:

1. **KO#1:** have the ability to describe and formulate the linear programming problems.
2. **KO#2:** have the ability to describe and formulate the Transportation and assignment problems.
3. K**O#3:** have the ability to describe the concepts of sequencing, game theory, markov process, and simulation techniques.
4. **UO#1:** have the ability to analyze and solve the problems in linear programming, Transportation, and assignment, sequencing and simulation problems.
5. **UO#2:** have the ability to analyze the concepts in game theory, markov analysis and appreciate the techniques to solve the problems.
6. **UO#3:** have the ability to analyze the concepts in job sequencing, theory of games, markov analysis, and simulation.
7. **AO#1:** have the ability to apply the mathematical techniques to solve real world problems.

Course Designed By	Department of CSE and IT
Approval	Approved By: Meeting of Board of Studies held on 29.08.2020
	Ratified By: 6th meeting of academic council held on 21.11.2020

	SEMESTER – IV	L	T	P	C
A2CII303	Computer Networks (Common to CSE and IT)	3	0	3	5
	Total Contact Hours: 48				
	Prerequisites: DLD, CAO				

Broad Objective:

The students shall gain an ability to identify and design a network architecture and apply the essence of various protocols.

Course Objectives:

1. Introduce the basic concepts of Computer Networks.
2. Familiarize with the layered approach and different layers of computer networks.
3. Familiarize with the design issues of different layers.
4. Explain the working of different protocols of a computer network.

Syllabus

UNIT – I

Overview of Data Communication and Networking: Introduction to data communications Components, Data Representation, Direction of data Flow, .Network Criteria, Physical Structures, Protocols and standards, Reference model : OSI,TCP/IP Reference Model, Addressing.

Physical Layer: Overview of data (Digital & analog), Signal (Digital & analog), Transmission (Digital & analog), Transmission Modes-Serial and Parallel, Multiplexing: TDM, FDM, WDM, Transmission Media: Guided and Unguided, Switching: Circuit Switched & Packet Switched.

UNIT – II

Data Link Layer: Types of errors, Framing (Bit and Character Stuffing) Error detection: Parity, CRC, Checksum, Error Correction: Hamming Code, Flow Control: Noiseless-Simplest, Stop and wait, Noisy: Stop and wait ARQ, Go Back N, and Selective Repeat.

Multiple Accesses: Random access: CSMA, CSMA/CD, CSMA/CA, Controlled Access: Reservation, Polling, Token Passing, Channelization: FDMA, TDMA, CDMA, Standard Ethernet: MAC, Physical Layer, Fast Ethernet: MAC, Physical Layer, Giga Bit Ethernet: MAC, Physical Layer, Changes in the standard: Bridged Ethernet, Switched Ethernet.

UNIT – III

Connecting LAN's: Connecting Device: Passive Hub, Repeaters, Active Hub, Bridges, Two Layer Switches, Routers, Three Layer Switches, Gateways, Bridges-Transparent Bridges, Loop Problem, Spanning tree to eliminate Loop Problem.

Addressing: IPv4 Addressing: Class full, Classless, Sub Netting, Super Netting NAT, IPv6 Addressing, and Internetworking: Need for network layer.

Network Layer: IPv4 data Format, IPv6 Data Format, Address Mapping: ARP, RARP, And BOOTP.

DHCP and Routing Protocols: DHCP, Delivery and Forwarding, Routing Table Format, Distance vector Routing, Path Vector routing, Link State Routing.

UNIT – IV

Transport Layer: TCP, UDP, Congestion Control: Open Loop, Closed Loop.

Quality of Service: Flow Characteristics, Techniques to Improves QOS: Scheduling, Traffic Shaping, Integrated Services and Differentiated services.

UNIT – V

DNS: Name Space, DNS, Distribution of Name Space, DNS in the Internet, Resolution, DNS Messages.

Remote Login &Application Layer: Telnet, Electronic Mail, WWW-Architecture, URL, Web Documents, HTTP.

Text Books:

1. Data Communications and Networking, Behrouz Forouzan, 4th Edition, Mc Graw Hill.

References:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.
2. Computer Networking: A Top Down Approach-James F Kurose and Keith W Ross, 6th edition, Pearson Education.

Course Outcomes:

The students will:

1. **KO#1:** Have ability to state & describe the functions of the basic hardware layers viz., Physical & Data Link Layers.
2. **KO#2:** Have the ability to list connecting devises and various protocols in Network Layer
3. **KO#3:** Have the ability to describe the protocols of Transport and Application Layers
4. **UO#1:** Have the ability to distinguish between various multiplexing techniques and transmission medium.
5. **UO#2:** Have the ability to distinguish between alternatives of various routing algorithms
6. **UO#3:** Have the ability to draw the inference from various Quality of Services of Transmission process
7. **AO#1:** Have the ability to apply and bring to bear the full complement of various layers and design the network architecture.

Course Designed By	Department of CSE and IT
Approval	Approved By: Meeting of Board of Studies held on 29.08.2020
	Ratified By: 6th meeting of academic council held on 21.11.2020

A2CII304	**SEMESTER – IV**	**L**	**T**	**P**	**C**
	Object Oriented Programming (Common to CSE and IT)	**3**	**0**	**3**	**5**
	Total Contact Hours : 48				
	Prerequisites: PPS Course				

Broad objective:

To introduce the concepts that will modularize, re use and proper accessing of data in designing the software.

Course Objectives:

Objective#1: Students will get exposure to basic pillars of Object Oriented Programming and how object oriented programming is better suited to model real word entities and their interactions;

Objective#2: Students will study and analyze the different object oriented constructs and how they are implemented in C++ and Java and contrast the approaches taken in C++ and Java and reasoning thereof.

Objective#3: Students will study and analyze advance language features like exception programming, multi-thread programming, event programming and Generics using Java programming language;

Object Oriented Programming

UNIT – I:

Basics of OO: Deficiencies with Structured Programming in C,OO Features - Abstraction, Encapsulation, Data Hiding (public, private), Class as a Mechanism for implementing the above in C++ & Java, Program structure ,Execution steps of C++ and JAVA, Byte Code, Platform Independence in JAVA, JAVA Virtual Machine, JAVA API, Constructor, Destructor, simple methods/functions both private & public within a class in .h & .cpp files – C++

Objects & Objects Interplay: Creating objects using static and dynamic memory allocation (new & free) in C++ , input/output using cin & cout and invoking methods (Simple C++ Programs), Constructor, finalize, simple methods/functions both private & public within a class and invoking methods using Java, Creating objects using dynamic memory allocation (new) in Java, garbage collection, input/output using Scanner & System.out(Simple Java Programs),manipulators in C++, Parameter Passing mechanisms ,Types of Constructors in C++ and Java.

UNIT – II:

Overloading: Scope & lifetime, Type conversion & Type Casting, Global variables & functions in C++ and Java, Arrays and passing Arrays as parameters in C++ and Java, Constructor overloading including Copy Constructor in C++ and Java, Function overloading within a class using C++ and Java. Operator overloading, Assignment Operator overloading in C++, why operator overloading not supported in Java.

Static Members: Class/static member variables and member functions, accessing static & instance member variables and member functions – C++; Class/static member variables and member functions, static block, accessing static & instance member variables and member functions – Java; In-line functions in C++, #ifdef and #ifndef to avoid duplicate definitions of classes, standard header files for Math, String. Command Line arguments - in C++ and Java. Formatted and unformatted data manipulators and user defined manipulators.

UNIT – III:

Single Inheritance: Inheritance & types of Inheritance – C++, Type Substitutability; Inheritance & types of Inheritance - Java, Type Substitutability; Method Overriding & super keyword, type casts – C++ and Java ,this & final, access-specifiers in C++ and java. Static Polymorphism using inheritance – C++.

Polymorphism & Packages: Dynamic polymorphism using inheritance including virtual destructor in C++ and Java, Contrast Inheritance & Composition with examples – in C++ & Java. Packages in Java and Name spaces in C++, Defining/Creating a Package in Java, package scope access specifier (default) in Java ,Installing a Package, setting up CLASSPATH, using classes in a Package, import key word , StringTokenizer, Math, util classes in Java.

Multiple Inheritance: Abstract & pure abstract classes in C++, Multiple Inheritance in C++ including private & protected inheritance, Problems with Multiple inheritance in C++, solutions to overcome the problem. Interfaces in Java, inheritance in Interfaces & contrast with pure abstract classes in C++, Multiple Interface inheritance in Java.

Other Features: Template functions & classes in C++, Friend functions & classes in C++. Passing built-in types by reference (pass by sharing) using boxing in Java, Mutable & Immutable objects in Java, String & StringBuffer classes & objects as examples, Simple File Handling using FileInputStream and FileOutputStream – in Java.

UNIT – IV:

Exceptions – Java: Exception Hierarchy, types of Exceptions, Errors, differences between Errors and Exceptions. Try, catch, finally, throw, multiple catch and multiple try, throws and exception stack trace unwinding. Creating & generating User Defined Exceptions. Some important built-in checked and unchecked Exceptions.

Threads – Java: Difference between Thread and Process, Thread Life Cycle. Thread class, Runnable Interface, Creating Threads. Synchronization, Notify & Wait mechanism in Threads, Deamon Threads, ThreadGroups.

UNIT – V:

AWT & Event Programming – Java : Component & Container classes, Layout managers, Label, TextField, TextArea, Button as examples of Components, Panel as example of Component/Container Class, Frame as example of Container/Window class. CheckBox, RadioButton, Choice, ComboBox Classes, Events, Listeners (ActionListener, MouseListener, KeyListener, WindowListener) and Event Queue , Adapter Classes, inner class.

Applets & Generics in Java: Applets lifecycle, Applet creation and deployment in web page. Generic classes, Collections, Comparator and Iterator interfaces. List & Set Collections classes. Map Interface & Map Interface based Collection classes.

Text Books:

3. C++ Primer, fifth edition, Stanley B. Lippman, Josee Lajoie.
4. The Complete Reference: Java, Herbert Schildt.

Reference Books:

1. The Design and Evolution of C++, Bjarne Stroustrup.
2. Thinking in Java, Eckel Bruce

Course Outcomes:

KO#1: have the ability to outline and describe Basics of OOP, Objects & Object interplay, Overloading, and Static Members;

KO#2: have the ability to outline and describe Single Inheritance, Polymorphism & Packages, Multiple Inheritance, and other Language Features in C++ and Java;

KO#3: have the ability to outline and describe Exceptions - Java, Threads - Java, AWT & Event Programming, and Applets & Generics in Java;

UO#1: have the ability to draw inferences on Basics of OOP, Objects & Object interplay, Overloading, and Static Members;

UO#2: have the ability to draw inferences on Single Inheritance, Polymorphism & Packages, Multiple Inheritance, and other Language Features in C++ and Java;

UO#3: have the ability to draw inferences on Exceptions - Java, Threads - Java, AWT & Event Programming, and Applets & Generics in Java;

AO#1: have the ability to apply and bring to bear the full complement of concepts of Object Oriented Programming as implemented in C++ and Java to address a problem in the relevant domain.

Course Designed By	Department of CSE and IT
Approval	Approved By: Meeting of Board of Studies held on 29.08.2020
	Ratified By: 6th meeting of academic council held on 21.11.2020

A2CHA701	SEMESTER - IV	L	T	P	C
	ENVIRONMENTAL SCIENCE	2	0	0	0
	Total Contact Hours – 30				

COURSE OBJECTIVES	
1.	To study about the scope and importance of multidisciplinary nature of environmental science.
2.	To study about the natural resources and their importance for the sustenance of life and the need to conserve natural resources.
3.	To study about the ecosystem and its function in the environment.
4.	To study about the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity.
5.	To study about the various types of pollution, its impact and measures to control pollution.
6.	To study about solid waste management techniques
7.	To study about the sustainability nature of environment

ENVIRONMENTAL SCIENCE

SYLLABUS:

UNIT – I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance of Multidisciplinary nature of Environmental Studies, Climate change: Global warming, Acid rains, Ozone layer depletion

UNIT – II:

Natural resources:

Forest resources, deforestation, case studies –Water resources – Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams – benefits and problems, Mineral resources: Use and exploitation, environmental effects of mining, case studies. Food resources- World food problems, effects of modern agriculture, Land resources-land degradation, soil erosion and desertification, Energy resources: Growing energy needs, renewable and non-renewable energy sources.

UNIT – III:

Part A:

Ecosystem: Concept of an ecosystem**,** Classification, Structure of an Ecosystem: Producers, consumers and decomposers, different functions of an ecosystem.

Part B:

Biodiversity

Definition and types: genetic, species and ecosystem diversity, Values of biodiversity, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – IV:

Environnemental Pollution :

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution.

UNIT – V: Social issues and the environment:

Sustainability, urban and energy related problems

Solid waste Management: Causes, effects and control measures of urban and industrial wastes,

Text Books:

1. Environmental Studies by Anubha Kaushik, 4th Edition
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

References:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi

Course Outcomes:

Students will be able to:

1. Understand the scope and importance of multidisciplinary nature of environmental science.
2. Understand the natural resources and their importance for the sustenance of life and the need to conserve natural resources.
3. Understand ecosystem and its function in the environment,
4. Understand the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity.
5. Understand the various types of pollution, its impact and measures to control pollution.
6. Understand solid waste management technologies.
7. Understand the sustainability nature of environment.

ENVIRONMENTAL SCIENCE														
CO / PO mapping	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO-1	2					1								
CO-2	1					2	2							
CO-3	2					2	1						1	
CO-4	1					1								
CO-5	1	1					1						1	
CO-6	1					2	1						1	
CO-7	1	1											1	

A2CHA701	**ENVIRONMENTAL SCIENCE**
Course designed by	Department of Chemical Engineering
Approval	Approved by: Meeting of Board of Studies held on 29th Jun, 2019
	Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020

	SEMESTER-V	L	T	P	C
A2CII202	**ARTIFICIAL INTELLIGENCE TOOLS, TECHNIQUES AND APPLICATIONS (Common to CSE and IT)**	**3**	**0**	**3**	**5**
	Total Contact Hours: 48				
	Prerequisites: Nil				

BROAD OBJECTIVE

Make students conversant with the theoretical concepts and algorithm approaches that can be applied to the design of AI applications.

COURSE OBJECTIVES

1. Introduce fundamental concepts in AI
2. Demonstrate the capability to create simple AI applications using Computer Vision, pattern recognition and machine learning.
3. Present various modeling and formulation techniques to solve problems using AI techniques.
4. Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

SYLLABUS

Unit I: Introduction to Artificial Intelligence
Basics of AI (Introduction to machine learning, deep learning, and neural networks). Applications of AI. Search Algorithms (Uninformed search (Depth Limited, Iterative Deepening, Bidirectional search) and Informed (Best First Search and A* Algorithm), Constraint satisfaction problems,
Simple Hill Climbing Algorithm, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning.

Unit II: Conceptual introduction to **Machine Learning:** Introduction to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, Deep Learning, Reinforcement Learning, Linear Regression. Applications (binary and multi classification techniques).

Unit III: Image Processing & Computer Vision:
Part-I
Image - Definition and Tagging. Classification of images. Tagging. Image formation, Preprocessing Techniques (scale, rotate) Image Enhancement (Image Smoothing and Sharpening), Image Segmentation (Point, Line and Edge detection) Techniques.
Part-II
Deep Learning algorithms for Object detection & Recognition. Face recognition, Instance recognition Feature detection and matching, Segmentation, Recognition Databases and test sets Applications -- Feature extraction, Shape identification. Face detection.
Applications: Automation, Agriculture [Crop and Soil Monitoring, Grading farm produce,

Predictive Analytics]

Unit-IV: BOT Technologies and Virtual Assistants:
Chatbots: Introduction to a Chatbot, Architecture of a Chatbot. NLP in the cloud, NL Interface, How to Build a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development. NLP components. NLP wrapper to chatbots.

Unit V: Reinforcement Learning
Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep Reinforced Learning.

Text Books:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach.
2. Digital Image Processing, By Rafael C Gonzalez, 3rd edition.
3. Build an AI Assistant with Wolfram Alpha and Wikipedia in Python. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe.

References:

1. Tom Markiewicz & Josh Zheng, Getting started with Artificial Intelligence, Published by O'Reilly Media,2017**.**
2. Aurélien Géron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017.
3. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)
4. Curated Datasets on Kaggle. https://www.kaggle.com/datasets

COURSE OUTCOMES

1. KO#1: Have the ability to explain in detail about the importance of basic concepts of AI and its search algorithms and the concepts of Machine Learning algorithms and their limitations.
2. KO#2: Have the ability to describe the various algorithms for image enhancement, segmentation& object detection and face recognition
3. KO#3: Have the ability to explain the best practices for Chatbot development and applications of Reinforcement Learning.
4. UO#1: Grasp the significance of AI Search algorithms and various machine learning algorithms.

5. UO#2: Grasp the significance to build different applications using Image Processing & Computer Vision techniques.
6. UO#3: Grasp the significance to develop Chatbots based on the requirements and usage of Action-Value function for an agent in an environment.
7. AO#1: Fully appreciate the basics of AI to build Image Processing & Computer Vision Applications and development of Chatbots.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

A2CII305	**SEMESTER-V**	**L**	**T**	**P**	**C**
	Database Management System (Common to CSE and IT)	**3**	**0**	**3**	**5**
	Total Contact Hours : 45				
	Prerequisites: None				

SYLLABUS

UNIT I: Introduction to Database Systems

Introduction: Data base System VS file System – Database applications, data base Users, Levels of Abstraction in DBMS and data independence, Database Languages – DDL – DML — data base System Structure – Storage Manager – the Query Processor

Database Design: Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model –Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT II: Relational Model

Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints –Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews.

UNIT III: Normalization

Part-1

Relational calculus – Tuple relational Calculus – Domain relational calculus

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins , Disallowing NULL values

Part-2

Schema Refinement: Problems caused by redundancy-decomposition-Problems related to decomposition-reasoning about FDs.

Normal Forms: First, Second, third, BCNF normal forms, Lossless join- dependency preserving Decomposition- schema refinement- Multivalued dependency, Fourth normal form.

UNIT IV: Transactions

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability.

Concurrency Control- Lock –Based Protocols – Timestamp Based Protocols- Validation-Based Protocols – Multiple Granularity- Multiversion Schemes, Deadlock handling

UNIT V: Recovery

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems-Remote Backup systems

Data on external Storage-File Organization and indexing- Cluster indexes, primary and secondary indexes-index data structures- Hash based indexing-Tree based indexing-comparison of File Organization- Indexes and performance Tuning- ISAM- B+ trees.

Text Books:

1. Raghurama Krishnan, Johannes Gehrke, "Data baseManagement Systems", 3rdEdition, TATA McGrawHill,2008.
2. Silberschatz, Korth, "Data base System Concepts",6th Edition, McGraw Hill, 2010.

Reference Books:

1. C.J. Date, "Introduction to Database Systems", 7th Edition,Pearson Education, 2002.
2. Elmasri Navrate, "Fundamentals of Database Systems",5th Edition, Pearson Education, 2007.

COURSE OUTCOMES

1. **KO#1**: will have the ability to explain different model for data organization and basic set theory concepts that lead to entity relationship modeling that is basis for RDBMS along with relational algebra and relational calculus notations
2. **KO#2**: will have the ability to explain and describe the different query and manipulations constructs available in SQL standard for data querying and manipulation, and how to design a good relational database eliminating redundancies using normalization.
3. **KO#3**: will have the ability to explain and describe the transaction management and recovery aspects of typical commercial RDBMS and how data storage of RDBMS is implemented using external data structures.
4. **UO#1**: grasp the significance of relational data modeling and structured querying on top of typical RDBNMS along with advantages of RDBMS and more specifically of DBMS over file systems.
5. **UO#2**: grasp the significance of structured approach to RDBMS design, the transactional and recovery features of RDBMS.
6. **UO#3**: grasp the significance of data structures used for external data storage of RDBMS in a file.
7. **AO#1**: full appreciate the need, working and feature set of relational database management systems.

Course Designed By	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

A2CIT303	**SEMESTER-V**	**L**	**T**	**P**	**C**
	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Total Contact Hours: 45				
	Prerequisites: Basic Knowledge of Programming and Mathematics, Data Structures				

SYLLABUS

UNIT – I: Introduction

Introduction: Algorithm, Algorithm specification - Pseudo code conventions, Recursive and Non-Recursive Algorithms, Performance Analysis – Space complexity, Time complexity, Asymptotic Notation, Amortized Complexity.
Disjoint sets: disjoint set operations, union and find algorithms.

UNIT – II: Basic Traversal and Search Techniques, Pattern Matching
Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS.
Pattern Matching: Naive String Matching Algorithm, Boyer-Moore Algorithm, Knuth-Morris-Pratt Algorithm.

UNIT – III: Divide and Conquer, Greedy Method
PART 1- Divide and Conquer
Divide and Conquer: General Method, applications – Binary Search, Defective Chessboard, Finding the Maximum and Minimum, Selection sort, Merge sort, Quick sort, Strassen's Matrix Multiplication.
PART 2: **Greedy Method**
Greedy Method: General Method, applications – Knapsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees – Prim's Algorithm, Kruskal's Algorithm, Optimal storage on tapes, Huffman Coding, Single Shortest Path.

UNIT – IV: Dynamic Programming
Dynamic Programming: General Method, applications – Matrix Chain Multiplication, All-pairs Shortest paths, Optimal Binary Search Trees, Single source shortest path : Bellman and Ford algorithm, 0/1 Knapsack Problem, Travelling Sales Person Problem, Reliability Design.

UNIT – V: Backtracking, Branch and Bound
Backtracking: General Method, N-Queens Problem, Sum of subsets problem, Graph Coloring, Hamiltonian cycles.
Branch and Bound: The Method, Control abstraction of LC-Search, 0/1 Knapsack Problem, Travelling salesperson, NP-Hard and NP-Complete Problems.

Text Books:

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekharam, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Fundamentals of DATA STRUCTURES in C: 2nd Edition., Horowitz, Sahni, Anderson –freed, Universities Press.

References:

1. Data Structures, A Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2. Introduction to The Design and Analysis of Algorithms, Anany Levetin, 3rd Edition, Pearson.

COURSE OUTCOMES

KO#1	Have the ability to **describe** algorithm specifications, determine time and space complexity of recursive and non-recursive algorithms, describe disjoint set operations, basic traversal techniques, pattern matching algorithms and analyze their complexities.
KO#2	Have the ability to **describe** divide and conquer technique, greedy method, and different application of greedy and divide and conquer techniques and analyze their complexities.
KO#3	Have the ability to **describe** dynamic programming technique, backtracking technique, branch and bound technique and different applications of dynamic programming, backtracking, Branch and bound techniques and analyze their complexities.
UO#1	**Grasp** the significance of time complexity calculations for different algorithms ,use disjoint set operations and pattern matching algorithms to solve challenging problems.
UO#2	**Grasp** the significance of problem solving using various divide and conquer techniques and greedy methods to solve challenging problems.
UO#3	**Grasp** the significance of problem solving using dynamic programming techniques ,back tracking techniques and branch and bound techniques in solving challenging problems.
AO#1	**Fully appreciate** the time and space complexities of various algorithms and apply these algorithms to design and analyze large, complex real world problems.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

	SEMESTER-V	L	T	P	C
A2CIT304	OPERATING SYSTEM (Common to CSE and IT)	3	0	0	3
	Total Contact Hours: 45				
	Prerequisites: Nil				

SYLLABUS

Unit 1: OS Basics: What operating systems do? Computer system architecture, OS Functionalities: Process management, memory management, storage Management, Protection and security, Computing environment: Traditional Computing, Client server computing, peer to peer computing, web based computing, OS Services, System calls, Types of System calls, Operating System Structure: Simple, Layered, Microkernels, Modules.

Unit 2: **Introduction to Processes and Process Scheduling:**
Introduction to Processes: Process, Process States, Process Control Block, Threads. Process Scheduling: Scheduling Queues, Schedulers, Context Switch. Operations On Processes: Process Creation, Process Termination. Multithreading Models: Threads Overview, Benefits, Multithreading Models: Many to One, One to One, Many to Many.
Process Scheduling: Basic Concepts: CPU- I/O Burst cycle, CPU Scheduler, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling Algorithms (Non-premptive): FCFS, SJF, Scheduling Algorithms II(pre-emptive): Priority Scheduling, Round Robin, Multilevel Queue, Multilevel Queue feedback. Inter-Process communication: Shared memory, Message Passing.

Unit 3: Process Synchronization & Deadlocks:
Process Synchronization: Introduction to process synchronization, Producer Consumer Problem, Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphore, Classical problems of synchronization: Bounded-buffer Problem, Readers Writers Problem, Dining Philosophers Problem, Monitors: Introduction, Usage, Dining-Philosophers Solution Using Monitors.

Deadlocks: Introduction, System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Recovery from Deadlocks.

Part II Memory Management: Basic Hardware, Address Binding, Logical vs Physical Address Space, Dynamic loading, Dynamic linking and shared libraries, Swapping, Contiguous Memory Allocation, Paging: Basic method, Hardware support, Protection, Shared pages, Structure of the Page Table, Segmentation. Virtual Memory Management: Background, Demand Paging: Basic Concepts, Performance of Demand Paging, Copy-On-Write, Page Replacement Algorithms: Basic Page Replacement, FIFO, Optimal, LRU, Counting Based. Thrashing: Causes of Thrashing, Working Set Model, Page-Fault Frequency.

Unit 4: Storage Management: File concept, File Attributes, File Operations, File Types, File Structure. Access Methods: Sequential Access, Direct Access, Other Access Methods, Directory structure: Storage Structure, Directory Overview, Single Level Directory, Two Level Directory, Tree Structured Directories, Acyclic Graph Directories, General Graph Directories. File System Mounting, File Sharing: Multiple Users. File protection: Types of

access, Access Control. File system implementation: Overview, Partitions and mounting, Virtual File System. Directory Implementation: Linear list, Hash table. File allocation methods: Contiguous allocation, linked allocation, Indexed allocation. Free space management: Bit Vector, Linked List, Grouping, Counting. File Recovery: Consistency Checking, Backup and Restore.

Unit 5: Secondary Storage Structure: Overview of Mass-Storage Structure: Magnetic Disks, Magnetic Tapes, Disk Structure, Disk Attachment: Host Attached, Network Attached, Storage Area Network, Disk Scheduling: FCFS, SSTF, SCAN, CSCAN, LOOK. Disk Management: Disk Formatting, Boot Block, Bad Blocks. Swap-Space Management: Swap Space Use, Swap Space Location. RAID Structure: Introduction, RAID levels, Stable Storage Implementation, Tertiary Storage Structure: Tertiary storage Devices, Operating System Support.

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education

REFERENCES :

1.http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/New_index1.html
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH
3. Operating System a Design Approach-Crowley, TMH.
4. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

COURSE OUTCOMES

1. **KO#1**: Have the ability to deal with Operating system abstractions such as processes, process scheduling and threads.
2. **KO#2**: Have the ability to describe, analyze the principles of process synchronization and Memory management.
3. **KO#3**: Have the ability to describe, analyze the file system, file system implementation and mass storage.
4. **UO#1**: Grasp the significance of basics of OS, compare appropriate process Scheduling algorithms and apply them to write the software programs to handle Scheduling.
5. **UO#2**: Grasp the significance of Process synchronization, memory management and how they might be applied for designing any given problem and grasp how they are important for any operating systems.
6. **UO#3**: Grasp the significance of File system and its implementation how they might be applied and grasp the usage of mass storage devices.
7. **AO#1**: Upon completion of the course students can try to design new components of operating system.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

A2CIT305	**SEMESTER-V**	**L**	**T**	**P**	**C**
	AUTOMATA THEORY AND COMPILER DESIGN (Common to CSE and IT)	**4**	**0**	**0**	**3**
	Total Contact Hours: 56				
	Prerequisites: Mathematical Foundations of Computer Science, Programming Languages				

SYLLABUS

Unit – I: Introduction to theory of computation

The central concepts of Automata Theory: Alphabet, Strings, Language Definitions with examples, Operations on Languages, Language Recognizers, Finite Automaton Model.
Deterministic and Non Deterministic Finite Automata: Deterministic finite automaton, Transition Tables and Diagrams, Types of States, Non-deterministic finite automaton.

Unit – II: Finite Automata with Epsilon-transitions and Regular Expressions

Finite Automata with Epsilon-transitions: NFA with Epsilon transitions, Equivalence between NFA without and with Epsilon transitions, Equivalence between DFA and NFA without Epsilon Transitions, Minimization of Finite Automaton.
Regular Expressions and Languages: Regular Expressions and Operators, Conversion from DFA to regular expression, Conversion from Regular expression to DFA, Algebraic Laws of Regular Expressions & Closure properties of Regular Languages.

Unit – III: Grammars and Compilers

Part-I - Context Free Grammars and Languages:
Context Free Grammars, Parse Trees and Ambiguity in Grammars: Chomsky Hierarchy of Languages, Context-Free Languages Definition, Left most and Right most derivations, Sentential forms, Derivation trees, Ambiguity in context free grammars and removing it.
Applications and Properties of CFLs: Closure Properties of CFL, Elimination of left recursion, left factoring, Applications of CFL.
Part-II – Compilers-Lexical and Syntax Analysis:
Compilers - Lexical Analysis: Compiler, Phases of a compiler, Tokens, patterns and lexemes, Attributes for tokens, Role of Lexical Analysis & Input Buffering, Lex tool & Sample Lex programs.
Compilers - Syntax Analysis: Parsing, role of parser, top down parsing, Computing first and follows, Recursive descent parser, Predictive Parsers, LL (1) Grammar & LL (1) Parsers.

UNIT-IV: Bottom-up Parsing and Syntax Directed Translation

Bottom up parsing – LR Parsers: SLR Parser, CLR Parser, LALR Parser, Yacc-Automatic Parser Generator.
Syntax Directed Translation and Intermediate Code Generation: Role of semantic analyzer, Syntax directed definitions and attributed grammars, Types of three address statements, Quadruples, Triples and Indirect triples.

UNIT-V: Code optimization and Code generation

Code Optimization: Basic blocks and flow graphs, Code optimization issues, Machine independent optimization techniques, Machine dependent code optimization techniques (peephole optimization).
Code Generation: Code generation issues, Generic code generation algorithm, Live variable analysis, DAG representation.

Text Books:
1. Introduction to Automata Theory, Languages, and Computation – John E. Hopcroft, Rajeev Motwani, Jefrey D Ullman.
2. Compilers, Principles Techniques and Tools- Alfred V Aho, Ravi Sethi, Jeffrey D. Ullman.

References:
1. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran.
2. Principles Of Compiler Design by ALFRED V.AHO, RAVI SETHI, J.D.ULLMAN

COURSE OUTCOMES
1. **KO#1:** Have the ability to list and outline the central concepts of Automata Theory, describe the Deterministic and Non Deterministic Finite Automata, Finite Automata with Epsilon-transitions, Regular Expressions and Languages.
2. **KO#2**: Have the ability to list the applications and properties of CFL describe the Context Free Grammars, Context Free Languages, Parse Trees and Ambiguity in Grammars, Compiler's lexical and syntax analysis phases.
3. **KO#3**: Have the ability to list and describe the LR Parsers, Syntax Directed Translation and Intermediate Code Generation, Code Optimization and Code Generation.
4. **UO#1**: Grasp the significance of formal languages and automata theory, Regular expressions and Regular languages and have the ability to compare and contrast DFA, NFA and epsilon.
5. **UO#2**: Grasp the significance of CFGs, CFLs, Lexical and syntax analysis phases of compiler and have the ability to give examples for CFGs and CFLs.
6. **UO#3**: Grasp the significance of Bottom up parsing, Syntax Directed Translation, data flow analysis, Code optimization and code generation and have the ability to compare and contrast various LR parsers and various intermediate representations.
7. **AO#1**: Fully appreciate the basics of formal languages and automata theory, the general organization of compilers and Compiler construction tools like LEX and YACC.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

A2CIT411	**SEMESTER - V**	**L**	**T**	**P**	**C**
	Data Mining (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Total Contact(Lecture) Hours: 45				
	Prerequisites: Basic Computer Knowledge				

SYLLABUS

UNIT-1 Introduction

Why Data Mining? What Is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. (Chapter 1)

UNIT-2 Getting to Know Your Data
Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. (Chapter 2)

UNIT-3
Part-1: **Data Preprocessing**
Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization (Chapter 3)

Part-2: **Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods**
Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods. (Chapter 4)

UNIT-4 Classification
Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy. (Chapter 8)

UNIT-5 Clustering
Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering. (Chapter 10)

Text Book:
Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann Publishers.

Course Outcomes:

At the end of the course, the student shall:

1. Gain knowledge in basic concepts of data mining, and understand data objects and attributes.
2. Gain knowledge of data preprocessing techniques and mining frequent patterns.
3. Gain knowledge of classification and clustering techniques.
4. Gain understanding of data mining, data objects and attributes.

5. Gain understanding of data preprocessing techniques and mining frequent patterns.
6. Gain understanding of classification and clustering techniques.
7. Fully appreciate the need, process, and techniques for mining information from data.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
	Ratified by: 6th meeting of academic council held on

A2CIT421	**SEMESTER-V**	**L**	**T**	**P**	**C**
	Switching, Routing, and Wireless Essentials (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Total Contact Hours: 40				
	Prerequisites: Computer Networks				

SYLLABUS

UNIT 1: Switching Concepts

Configuring a switch with initial settings: Switch boot sequence, Switch LEDs, recover from system crash, Switch management access, Switch SVI configuration example; Configuring a switch with initial settings: Duplex communication, configure switchport at physical layer, AUTO-MDIX, Switch verification commands; Network access layer issues, Interface input output errors, trouble shooting network access layer issues.; Secure remote access: Telnet operation, SSH operation, configure SSH, verify SSH.
Basic router configuration: Configure basic router settings, Dual stack topology, configure router interfaces, IPv4 loopback interfaces.; Verify directly connected networks: interface verification commands, verify interface status, verify IPv6 link local and multicast addresses, verify interface configuration, verify routes, filtering show command output, command history.; **Switching Concepts**: Frame forwarding methods, collision domains, broad domains, Features of the switch that alleviate congestion.; VLANs: Overview, definitions, types.

UNIT 2: VLANs

VLANs in a Multi-Switched Environment: Defining VLAN trunks, Networks without VLANs, Networks with VLANs, VLAN identification with a Tag.; Native VLANs and 802.1Q tagging, Voice VLAN tagging, Voice VLAN verification.; VLAN: Configuration, VLAN ranges in Catalyst Switch, VLAN creation commands with example, VLAN port assignment commands.; Data and Voice VLAN example, verify VLAN information, change VLAN port membership, Delete VLANs.
VLAN trunks: Trunk configuration commands, Trunk configuration example, verify trunk configuration, reset the trunk to default.; Dynamic Trunking Protocol (DTP): Introduction to DTP, Negotiated Interface Modes, Results of a DTP configuration, verify DTP mode.; Inter VLAN routing: Definitions, Legacy inter-VLAN routing, 'router-on-a-stick' inter-VLAN routing.; Inter-VLAN Routing on a Layer 3 Switch, Router-on-a-Stick Scenario (configurations)

UNIT 3: STP, DHCP, LAN Security

Part 1:
Purpose of STP, STP operations: Steps to a Loop-Free Topology, Elect the root bridge, Elect the root ports, Elect designated ports, Elect alternate (blocked) ports.; Elect a Root Port from Multiple Equal-Cost Paths, STP Timers and Port States, Operational Details of Each Port State, Per-VLAN Spanning Tree, Different Versions of STP.; EtherChannel: Link aggregation, EtherChannel technology, Advantages of EtherChannel.; EtherChannel implementation restrictions, AutoNegotiation Protocols, PAgP operation,
LACP Operation, Configure EtherChannel, verify EtherChannel; DHCPv4: Server and

Client, DHCPv4 operation, Configure a Cisco IOS DHCPv4 Server.; Verify DHCPv4 is Operational, Disable the Cisco IOS DHCPv4 Server, DHCPv4 Relay; Other Service Broadcasts Relayed, Configure a DHCPv4 Client.

Part 2:

First Hop Redundancy Protocols (FHRP): Default Gateway Limitations, Router Redundancy, Steps for Router Failover, FHRP Options; HSRP Overview, HSRP Priority and Preemption, HSRP States and Times.; LAN Security: Endpoint security: Network attacks today, Network security devices, Endpoint protection.; Cisco ESA, Cisco WSA, Access Control: Authentication with a Local Password, AAA components.

802.1X, Layer 2 Vulnerabilities, Switch attack categories, Switch attack mitigation techniques.; MAC address table attack, mitigation, VLAN hopping attack.; VLAN Double-Tagging attack, DHCP attacks.; ARP Attacks, STP Attacks, and CDP Reconnaissance.

UNIT-4: Routing Concepts

Routing concepts: Functions of router, example, longest match for IPv4 and IPv6, Build the routing table.; Packet forwarding decision process, Packet forwarding mechanism; IP routing table: Route source, routing table principles, routing table entries, directly connected networks, static routes.; Dynamic routing protocols, Dynamic Routes in the Routing Table, Default route, structure of IPv4 routing table, structure of IPv6 routing table, Administrative distance.

Static Vs Dynamic routing, Dynamic routing evolution, Dynamic routing protocol concepts, best path, load balancing.; IP Static routing: Types, next hop options, ip route command, ipv6 route command, Configuring static routing.; Default static route, floating static routes.; Host routes, troubleshooting static and default routes.

UNIT-5 Wireless LAN

Wireless LAN (WLAN): Benefits, Types, Wireless technologies, 802.11 standards.; Wireless standard organizations, WLAN components.; WLAN Operation, 802.11 wireless topology modes, BSS and ESS, 802.11 frame structure.; CSMA/CA, Wireless client and AP association, Passive and Active discover modes, CAPWAP.

Channel management: Frequency Channel saturation, Channel selection, plan a WLAN deployment.; WLAN threats: DoS attacks, Rouge access points, MITM attack, Securing WLAN: SSID Cloaking and MAC Address Filtering.; 802.11 Original Authentication Methods, Shared Key Authentication Methods, Authenticating a Home User, Encryption Methods, Authentication in the Enterprise, WPA 3.; The Wireless Router, WLAN configuration steps.

Course Outcomes:

1. To understand and configure switch for basic functionality, use VLANs.
2. To differentiate Inter-VLAN methods, understand the purpose of STP and EtherChannel.
3. To configure DHCPv4, HSRP. Understand LAN security issues.
4. To configure switch port security and mitigate switch level attacks.
5. To explain WLAN concepts and security issues.
6. To describe routing tables and perform static routing.
7. To perform basic network configuration and troubleshooting, identify and mitigate LAN security threats, and configure and secure a basic WLAN.

Text Book:
Switching, Routing, and Wireless Essentials v7.0 (SRWE) Companion Guide, Cisco Press.

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 30th July 2021
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	SEMESTER-V	L	T	P	C
A2CIT431	**SERVICE ORIENTED ARCHITECTURE (Common to CSE and IT)**	**3**	**0**	**0**	**3**
	Total Contact Hours: 45				
	Prerequisites: WEB TECHNOLOGIES, OOAD				

SYLLABUS

UNIT – I: [6 HOURS]

Software Architecture: Need for Software Architecture, Objectives of Software architecture, Types of IT Architecture, Architectural patterns and styles

Service-Oriented Architecture: Service orientation in daily life, Evolution of SOA, Drivers for SOA, Dimensions of SOA, Key components of SOA, Perspectives of SOA.

UNIT – II: [8 HOURS]

Enterprise-wide SOA: Considerations for Enterprise-wide SOA, Strawman architecture, Enterprise SOA layers, Application development process, SOA methodology for the enterprise.

Enterprise Applications: Architectural considerations, Solution architecture for enterprise Applications, solution architecture for the enterprise.

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UNIT – III: [5+6=11 HOURS]

PART-1: [5 HOURS]

Enterprise Service Bus: Routing and Scalable connectivity, Protocol transformation, Data/message transformation, core functionalities, optional features, logical components, deployment configurations, types of ESBs, Practical usage scenarios.

PART-2: [6 HOURS]

Service-Oriented Analysis and Design: Need for models, principles of service design, design of activity services, design of data, client and business process services

SOA Governance, Security and Implementation: SOA governance, SOA security, approach for enterprise-wide SOA implementation

UNIT – IV: [11 HOURS]

Web services Overview: Heterogeneity problem, XML, SOAP, WSDL, UDDI registry, WS-

1 Basic profile

Technologies for SOA:

XML: Namespaces, schemas, processing/passing models

SOAP: messages, elements, attributes and processing model, message exchange types, HTTP binding

WSDL: containment structure, elements of abstract description, elements of the implementation part, logical relationships, SOAP binding

UDDI Registry: Basic data model, tmodel, categorization and identification schemes, binding template, use of WSDL in the UDDI registry

UNIT – V: [7 HOURS]

Web Services Implementation: Implementation Choices, Building Web Service Clients, Building Web Services, Bottom-Up Approach, Commercial Tools

TEXTBOOKS:

1. SOA Based Enterprise Integration: A step by step guide to services-based application integration – Waseem Roshen, Tata Mc-Graw Hill Edition.
2. Service-Oriented Architecture for Enterprise and Cloud applications – Second edition – Shankar Kambhampaty- Wiley India

REFERENCES:

1. Introduction to service-oriented modeling-Service oriented Modeling: Service analysis, design and architecture – Wiley & Sons.
2. Service-Oriented Architecture: Concepts, technology and design-Thomas Erl-Pearson Education 2005
3. SOA and Cloud computing: Practices, patterns and technologies – Anthony Assi,Toufic Bobez, Nitin Gandhi-Prentice Hall/Pearson PTR

COURSE OUTCOMES

1. To understand the principles of service-oriented architecture and describes the desired enterprise organization and manner of operation.
2. To understand ESB, modelling, design for SOA applications and establish SOA Governance, implement SOA Security solutions and strategy.
3. To understand and describe the standards & technologies of modern web services

implementations.

4. To understand the architectural approach in which applications make use of services available in the network and to enhance the efficiency, agility and productivity of an enterprise, by exposing business processes as reusable services on a common software platform.
5. Understanding data exchange via ESB, effective SOA governance program, distributed nature of SOA makes addressing security concerns a critical success factor.
6. To Understand the web service interoperability, security, and future of web services with the implementation of cloud computing and also how to create web services and web services clients with state-of-the-art tools.
7. To understand how SOA aims to structure procedures or software components as services, provide a mechanism for publishing available services, which includes their functionality and input/output (I/O) requirements and also control the use of these services to avoid security and governance problems.

Course Designed by	Department of CSE and IT
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A2CIT441	**SEMESTER-V**	**L**	**T**	**P**	**C**
	BIO INFORMATICS (Common to CSE and IT)	**3**	**0**	**0**	**3**
	Total Contact Hours: 45				
	Prerequisites: Nil				

SYLLABUS

UNIT I – BIOINFORMATICS: AN INTRODUCTION

Introduction-Historical Overview and Definition- Bioinformatics Applications, Major Databases in Bioinformatics- Data Management and Analysis- Molecular Biology and Bioinformatics- Central Dogma of Molecular Biology

UNIT II –DATABASES

Introduction- Characteristics of Bioinformatics Databases- Categories of Bioinformatics Databases- Navigating databases- Sequence Databases Nucleotide sequence database- secondary Nucleotide sequence database – protein sequence databases- structure databases- Structure file formats- Protein Structure Database Collaboration- PDB- CATH –SCOP- Other databases- Enzyme Databases- MEROPS- Pathway Databases: CAZy

UNIT III –

TOOLS

Introduction- Need for Tools- Knowledge Discovery- Data- Mining Tools- Data Submission tools- Nucleotide Sequence Submission and Protein Submission tools- Data Analysis tools- Prediction Tools- Phylogenetic trees and Phylogenetic Analysis- Modelling Tools

ALGORITHMS

Introduction- Classification of Algorithms- Biological Algorithms- Implementing Algorithms- Biological Algorithms- Bioinformatics Tasks and Corresponding Algorithms- Data Analysis Algorithms- Sequence Comparison Algorithms – Substitution Matrices Algorithms –Sequence Alignment Optimal Algorithms- Prediction Algorithms- Phylogenetic prediction Algorithm – Protein Structure Prediction

UNIT IV–GENOME ANALYSIS AND SEQUENCE ALIGNMENT

Introduction- Genome Analysis- Genome mapping- The Sequence Assembly Problem- Genome Sequencing- Biological Motivation of Alignment Problems

UNIT V

Methods of Sequence Alignments- Using Scoring matrices- Measuring Sequence Detection Efficiency- Working with FASTA and BLAST

TEXT BOOKS

1. OrpitaBosu, Simminder KaurThukral , “Bioinformatics: Database, Tools, Algorithms”, Oxford University Press, Chennai, 2007. (Part B---Unit-II, Part C---Unit-III, Part D---Unit-IV)
2. Rastogi S. C., NamitaMendiratta, Parag Rastogi, “Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery”, Third Edition, PHI Learning Pvt. Ltd., New Delhi, 2011.(Chapter-1---Unit-I, Chapter 3,4 and 6--Unit-V, UNIT - VI)

REFERENCES

1. Bryan Bergeron, “Bioinformatics computing”, PHI Learning Pvt. Ltd, New Delhi, 2010.
2. Rastogi S.C., NamitaMendiratta, Parag Rastogi, “Bioinformatics: Concepts”, Skills & Applications, Second Edition, CBS Publishers & Distributors Pvt. Ltd, 2009
3. Arthur M. Lesk, “Introduction to Bioinformatics”, Third Edition, Oxford University Press, Chennai, 2010 4. Gautham N., “Bioinformatics:Databases and Algorithms”, alpha Science 2006 5.http://staff.aub.edu.lb/~webbic/nemer/index.html
6.http://bip.weizmann.ac.il/education/course/introbioinfo/04/lect1/introbi oinfo04/index.html
7. http://engineeringppt.net/algorithms-in-bioinformatics-pdf-lecture- notes/

COURSE OUTCOMES

1. The Students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence- based searches, and analyze and discuss the results in light of molecular biological knowledge.
2. The Students will be able to explain the major steps in pairwise and multiple sequence alignment, explain the principle for, and execute pairwise sequence alignment by dynamic programming.
3. The Students will be able to predict the secondary and tertiary structures of protein sequences.

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