

# FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, twice Accredited by NBA, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade in July 2018 for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since a decade to attain the current academic excellence, if not improving upon the standards and ethics. Consequently, statutory bodies such as the Academic Council and the Boards of Studies have been constituted under the supervision of the Governing Body of the College and with the recommendations of the JNTU Hyderabad, to frame the regulations, course structure and syllabi for autonomous status.

The autonomous regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution along with certain valuable suggestions from professionals of various ancillary fields such as the academics, the industry and the research, all with a noble vision to impart quality technical education and contribute in catering fullfledged engineering and management graduates to the society.

All the faculty members, the parents and the students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering and management graduates.

# **CMR INSTITUTE OF TECHNOLOGY**

Vision: To create world class technocrats for societal needs.

**Mission:** Impart global quality technical education for a better future by providing appropriate learning environment through continuous improvement and customization.

**Quality Policy:** Strive for global excellence in academics & research to the satisfaction of students and stakeholders.

# **Department of Computer Science & Engineering (CSE)**

**Vision:** To be a model for academic excellence and research in the field of computer science and engineering that prepares competent professionals with innovative skills, moral values and societal concern.

**Mission:** Impart quality education through state-of-art curriculum, conducive learning environment and research with scope for continuous improvement leading to overall professional success.

# M.Tech. - Regular Two Year Post Graduate Degree Programme (For batches admitted from the academic year 2020 - 21)

# PREAMBLE

For pursuing M.Tech. - Regular Two Year Post Graduate Degree Programme offered by CMR Institute of Technology (CMRIT) under Autonomous status will herein be referred to as CMRIT (Autonomous).

All the specified rules are herein approved by the Academic Council. These rules will be in force and are applicable to students admitted from the academic year 2020-21 onwards. Any reference to "**Institute**" or "**College**" in these rules and regulations stand for CMRIT (Autonomous).

All the rules and regulations specified shall hereafter be read as a whole for the purpose of interpretation, as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, CMRIT (Autonomous) shall be The Chairman, Academic Council.

#### 1. POST GRADUATE PROGRAMS OFFERED

**CMR Institute of Technology,** an autonomous college affiliated to JNTUH, offers M.Tech. -Regular 2 years (4 semesters) Post Graduate Degree Programme, under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations with effect from the academic year 2020 - 21 onwards. The following specializations are offered at present for the M. Tech. programme of study.

Sl.	Programme	Offering Department
No.		
1	Structural Engineering	Civil Engineering
2	CAD/CAM	Mechanical Engineering
3	VLSI System Design	Electronics & Communication
		Engineering
4	Computer Science and Engineering	Computer Science and Engineering

# 2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

# 2.1. Admission into first year of M.Tech. - Regular Two Year Post Graduate Degree Programme

- **2.1.1** Eligibility: A candidate seeking admission into the first year of M.Tech. shall be made subject to eligibility and qualification as prescribed by the university from time to time. Admissions shall be made on the basis of merit/rank obtained by the candidate qualified at TSPGECET/GATE or any entrance test conducted by the university or on the basis of any other order of merit as approved by the university, subject to reservations as laid down from time to time by government of Telangana.
- **2.1.2** Admission Procedure: Admissions are made into the first year M.Tech. as per the stipulations of the TSPGECET/GATE.
  - (a) Category A: 70% seats are filled through TSPGECET/GATE counseling.
  - (b) Category B: 30% seats are filled by the management.
- **2.2.** College Transfers: There shall be no college transfers after the completion of admission process.

**2.3. Medium of Instruction:** The medium of instruction and examinations for the entire M.Tech. - Programme will be in **English** only.

# 3. M.Tech. PROGRAMME (PGP in E&T) STRUCTURE

- **3.1** Admitted under M.Tech. (PGP in E&T) Regular Two Year Post Graduate Degree Programme:
- **3.1.1** A student after securing admission shall pursue the post graduate programme in M.Tech. Programme for a minimum period of two academic years (4 semesters), and a maximum period of four academic years (8 semesters) starting from the date of commencement of first year first semester, failing which he/she shall forfeit his/her seat in M.Tech. Programme.
- **3.1.2** I Year is structured to provide typically 18 Credits in each of the I and II Semesters, and II Year 16 credits in each of the III & IV semesters, totaling to 68 Credits for the entire M.Tech. Programme.
- **3.1.3** Each student shall secure 68 credits (with CGPA  $\geq$  5) required for the completion of the post graduate programme and award of the M.Tech. Degree.
- **3.2** UGC/AICTE specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

#### **3.2.1 Semester Scheme:**

M.Tech. (Regular) Programme is of 2 academic years (4 semesters) with the each academic year being divided into two semesters. Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester and shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and curriculum/course structure as suggested by AICTE / JNTUH. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design / Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

# **3.2.2 Credit Courses:**

a) All subjects/courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each subject/course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure, based on the following general pattern.

Theory		Practical				
1 Hr. Lecture (L) per week 1 credit		1 Hr. Practical (P) per week	0.5 credit			
1 Hr. Tutorial (T) per week	1 credit	2 Hrs Practical (Lab) per week	1.0 credit			

All Mandatory Courses, Study Tour, Guest Lecture, etc., will not carry any Credits.

#### **3.2.3** Subject/ Course Classification:

The College has followed the guidelines issued by AICTE/UGC. All Subjects/Courses offered for the PGP in E&T are broadly classified as Program Core, Program Elective, Open Elective, Audit Course, Minor Course and Mini Project with Seminar, Industrial Training and Dissertation.

# 3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the M.Tech. Degree Programmes is as listed below:

<i>S</i> .	Broad Course	Course Group/	Courses Description					
No.	Classification	Category						
	Core Courses	PC- Program	Includes core subjects related to the Parent					
	(CoC)	Core	Discipline/ Department/ Branch of Engineering.					
		Dissertation	M.Tech. Project or PG Project or PG Major Project					
		Mini Project	Seminar based on core contents related to parent					
		with Seminar	discipline/department/branch of Engineering					
		Minor Courses	s 1 or 2 Credit courses					
		Audit Courses	Mandatory courses (non credit)					
	Elective	PE– Program	Includes Elective subjects related to the Parent					
	Courses	Electives	Discipline/ Department/ Branch of Engineering.					
	(EℓC)	OE-Open	Elective subjects which include inter-disciplinary					
		Electives	subjects in an area outside the parent discipline/					
			department/ branch of Engineering					

\* Students are encouraged to go to Industrial Training/Internship for at least 4 - 6 weeks during semester break.

# 4. COURSE REGISTRATION

- **4.1** A **'Faculty Advisor or Counselor'** shall be assigned to each student, who advises the student about the M.Tech. Programme, its course structure and curriculum, choice / option for subjects / courses, based on his/her competence, progress, pre-requisites and interest of the students.
- 4.2 A Student may be permitted to Register for Subjects / Courses of 'his/her CHOICE' with a typical total of 18 Credits per Semester in I Year (Minimum being 15 Credits and Maximum being 21 Credits, permitted deviation being ±15%), and 16 Credits (inclusive of Project) per III Semester in II Year (Minimum being 14 Credits and Maximum being 21 Credits), 16 credits (inclusive of Project) per IV Semester in II Year (minimum being 16 Credits and maximum 21 Credits), based on his interest, competence, progress, and 'Pre-Requisites' as indicated for various Subjects/ Courses, in the Department Course Structure (for the relevant Specialization) and Syllabus contents for various Subjects/ Courses.
- **4.3** Choice for 'additional Subjects / Courses' in any Semester (above the typical 18/16 Credit norm, and within the Maximum Permissible Limit of 21/21 Credits, during I/ II Years as applicable) must be clearly indicated in the Registration, which needs the specific approval and signature of the Faculty Advisor/ Counselor on hard-copy.
- **4.4** Dropping of Subjects/ Courses in any Semester of I Year may be permitted, ONLY AFTER obtaining prior approval and signature from the Faculty Advisor (subject to retaining a minimum of 15 Credits), 'within 15 Days of Time' from the beginning of the current Semester.
- 4.5 Core Electives: Students have to choose five core electives as per the course structure.
- **4.6 Open Electives**: Students have to choose open elective other than parent department as per the course structure.
- **4.7 Project work registration:** The Project shall start immediately after the completion of I year II semester. Every Student must compulsorily register for his/her M.Tech. Project Work. The student registered for the Project work shall work for two semesters.

# 5. ATTENDANCE REQUIREMENTS

The programmes are offered based on a unit system with each subject being considered a unit. Attendance is calculated separately for each subject.

- **5.1** Attendance in all classes (Lectures / Laboratories) is compulsory. The minimum required attendance in each theory subject (*also mandatory (audit) courses*) excluding the attendance of mid-term examination is 75%. A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75%.
- **5.2** A student's Seminar report and presentation on Mini Project shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar presentation classes on Mini Project during that Semester.
- **5.3 Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject (Theory / Lab / Mini Project with Seminar) of a semester shall be granted by the College Academic Committee on genuine reasons.
- 5.4 A prescribed fee per subject shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.
- 5.5 Shortage of Attendance below 65% in any subject shall in **no case be condoned.**
- 5.6 A Student, whose shortage of attendance is not condoned in any Subject(s) (Theory / Lab / Mini Project with Seminar) in any Semester, is considered as 'Detained in that Subject(s), and is not eligible to write Semester End Examination(s) of such Subject(s), (in case of Mini Project with Seminar, his/her Mini Project with Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek reregistration for those Subject(s) in subsequent Semesters, and attend the same as and when offered.
- **5.7** A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.
- 5.8 a) A student shall put in a minimum required attendance in at least three theory subjects (excluding *mandatory* (*audit*) course) in first Year I semester for promotion to first Year II Semester.

**b**) A student shall put in a minimum required attendance in at least **three theory subjects** (**excluding** *mandatory* (*audit*) **course**) in first Year II semester for promotion to second Year I Semester.

# 6. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 5.

- 6.1 A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% Marks (28 out of 70 Marks) in the End Semester Examination, and a minimum of 50% of Marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing B Grade or above in that Subject.
- 6.2 A Student shall be deemed to have satisfied the academic requirements and earned the Credits allotted to Mini Project with Seminar, if student secures not less than 50% of the total Marks to be awarded. The Student would be treated as failed, if the student -

- (i) does not present the Mini Project with Seminar as required, or
- (ii) Secures less than 50% of Marks (< 50 Marks) in Mini Project with Seminar.
- 6.3 A Student shall register for all Subjects covering 68 Credits as specified and listed in the Course Structure for the chosen PGP Specialization, put up all the Attendance and Academic requirements for securing 68 Credits obtaining a minimum of B Grade or above in each Subject and 'earn all 68 Credits securing Semester Grade Point Average (SGPA)  $\geq 6.0$  ( in each Semester) and final Cumulative Grade Point Average (CGPA) (i.e., CGPA at the end of PGP)  $\geq 6.0$ , to successfully complete the PGP.
  - Note: (1) The SGPA will be computed and printed on the marks memo only if the student passes in all the subjects offered and gets minimum B grade in all the subjects.
    - (2) CGPA is calculated only when the student passes in all the subjects offered in all the semesters.
- 6.4 Marks and Letter Grades obtained in all those Subjects covering the above specified 68 Credits alone shall be considered for the calculation of final CGPA, which shall be indicated in the Grade Card / Marks Memo of II Year II Semester.
- 6.5 If a student registers for some more 'extra Subjects' (in the parent Department or other Departments/Branches of Engineering.) other than those listed Subjects totaling to 68 Credits as specified in the Course Structure, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 68 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 5 and 6.1 6.4 above.
- 6.6 Students who fail to earn 68 Credits as per the specified Course Structure, and as indicated above, within 4 Academic Years from the date of Commencement of their I Year, shall forfeit their seats in M.Tech. Programme and their admissions shall stand cancelled.
- 6.7 When a student is detained due to shortage of attendance in any subject(s)/seminar in any semester, no Grade Allotment will be done for such Subject(s)/Seminar, and SGPA/ CGPA calculations of that Semester will not include the performance evaluations of such subject(s)/seminar in which he got detained. However, he becomes eligible for re-registration of such subject(s)/seminar (in which he got detained) in the subsequent Semester(s), as and when next offered, with the Academic Regulations of the Batch into which he gets readmitted, by paying the stipulated fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of Internal Marks (CIE) and End Semester Examination Marks (SEE) for performance evaluation in such subject(s), and subsequent SGPA/ CGPA calculations.
- 6.8 A student eligible to appear in the Semester End Examination (SEE) in any subject, but absent at it or failed (failing to secure B Grade or above), may reappear for that subject at the supplementary examination (SEE) as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over, and added to the marks to be obtained in the supplementary examination (SEE), for evaluating his performance in that Subject.

# 7. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

7.1 The performance of a Student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 Marks for Theory or Practical's or Mini Project with Seminar or Drawing/Design etc; however, the M.Tech. Project Work (Major Project) will be evaluated by the external examiner for 100 Marks.

- **7.2** a) For Theory Subjects (inclusive of Minor Courses), during the Semester, there shall be 2 mid-term examinations for 25 marks (with duration of 120 minutes). Further, there will be an allocation of 5 marks for Assignment.
  - **b**) The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.
  - c) First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second mid-term examinations. The Assignments shall be as specified by the concerned subject teacher.
  - **d**) The first mid-term examination Marks and first Assignment Marks shall make one set of CIE Marks, and the second mid-term examination Marks and second Assignment Marks shall make second set of CIE Marks. The final CIE marks (for total of 30) are the better of these two mid-term examinations in each subject.
- 7.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 Internal Marks, and 70 Marks are assigned for Lab/Practical's Semester End Examination (SEE). Out of the 30 Marks for Internals, day-to-day work assessment in the laboratory shall be evaluated for 20 Marks; and the performance in an internal Lab/Practical Test shall be evaluated for 10 marks, there shall be two internal Lab/Practical Test in a semester and the better of these two shall be taken as final marks. The SEE for Lab / Practical's shall be conducted at the end of the Semester by the concerned Lab teacher and external examiner appointed by the Head of the Institution.
- 7.4 For mandatory (audit) courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. No marks or letter grades shall be allotted for mandatory (audit) courses. Only Pass/Fail shall be indicated in Grade Card.
- 7.5 There shall be a Mini Project with Seminar presentation in I Year II Semester for 100 marks, for which the student shall collect the information on a specialized topic, prepare a Mini Project Report and submit to the department. The Continuous Internal Evaluation (CIE) of 30 Marks evaluated by the guide / supervisor and Semester End Examination (SEE) of 70 marks evaluated by the committee. The evaluation committee consisting of Head of the Department, Mini Project Guide and senior faculty as appointed by Head of the Department.

# 7.6 Guidelines for Project Work Evaluation:

- a) The Project shall start immediately after the completion of I year II semester. Every Student must register for his M.Tech. Project Work, within the 4 weeks after the completion of I year II Semester. The student registered for the Project work shall work for two semesters. After Registration and in consultation with the guide, the Student has to present the title, objective and plan of action of his project work to the Project Review Committee (PRC) for approval within 6 weeks after the completion of I year II Semester. Only after obtaining the approval of the PRC, the student can initiate the Project work.
- b) A Project Review Committee (PRC) shall be constituted by Head of the Department and shall consist of the Head of the Department (Chairperson) Project Guide and one senior faculty member of the Department.
- c) If a student wishes to change his Guide or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/Guide leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Guide or topic as the case may be.

# 7.7 Monitoring of Project work progress by PRC

- a) The PRC will monitor the progress of the Project Work of the student. Project work Review-I will be held at the end of the III Semester (II Year I Semester) and Project work Review- II will be held at the end of the IV Semester (II year II Semester) before the submission of Project Report/ Dissertation.
- b) The Project Work Review-I: There shall be a Dissertation-I/Industrial Project-I during the III Semester (II Year I Semester). The Dissertation-I/Industrial Project-I shall be evaluated by the project external viva-voce examination committee for 70 Marks (which will be considered as SEE). The student has to get a minimum of 40% marks (28 marks out of 70 marks) for successful completion. Project guide and PRC-I shall evaluate for 30 marks (which will be considered as CIE). The guide evaluates for 15 marks and PRC-I evaluates for rest of 15 marks. The student has to secure a minimum of 50 marks (CIE + SEE) out of 100 marks to be declared successful. If the student fails to obtain the minimum marks, the student has to reappear for the Dissertation-I/Industrial Project-I during the supplementary examinations. The student shall be permitted to register Dissertation-II/Industrial Project-II only after successful completion of Dissertation-I/Industrial Project-I.
- c) The Project Work Review-II: There shall be a Dissertation-II/Industrial Project-II during the IV Semester (II Year II Semester). The Dissertation-II/Industrial Project-II shall be evaluated by the project external viva-voce examination committee for 70 Marks (which will be considered as SEE). The student has to get a minimum of 40% marks (28 marks out of 70 marks) for successful completion. Project guide and PRC-II shall evaluate for 30 marks (which will be considered as CIE). The guide evaluates for 15 marks and PRC-II evaluates for rest of 15 marks. The student has to secure a minimum of 50 marks (CIE + SEE) out of 100 marks to be declared successful. If the student fails to obtain the minimum marks, the student has to reappear for the Dissertation-II/Industrial Project-II during the supplementary examinations.
- d) To satisfy item (c), the student has to submit a soft copy of the final consolidated report of Dissertation - I & II / Industrial Project – I & II to the Head of the Department for 'ANTIPLAGIARISM' check. The Head of the Department should carry out plagiarism check and submit the report to the Principal. The Dissertation will be accepted for submission, only if the similarity index is less than 30%. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the Dissertation only after one month. Only after submission of a hard copy of final project report in 4 copies along with plagiarism report, the Dissertation-II / Industrial Project-II shall be evaluated by the project external viva-voce examination committee. The maximum number of re-submissions of Dissertation after plagiarism check is limited to TWO.
- e) The candidate has to register for the project and work for two semesters (not less than 44 weeks including registration and approval of Project-I and Project-II). After three attempts (including regular attempt), the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.
- f) The Student shall be allowed to submit his Project Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Practical's.), Mini Project with Seminar, etc. (securing B Grade or above), and after obtaining all approvals from PRC.
- g) Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the College/School/Institute, after submission of a research paper related to the Dissertation work in a reputed journal / conference. A copy of the submitted research paper shall be attached to thesis.

- h) The Dissertation of the student will be evaluated by the committee along with external examiner (appointed by the Head of the Institution) based on his/her presentation followed by viva-voce examination.
- i) If the report of the committee is unsatisfactory, the student shall revise and resubmit the project after ONE semester, or as per the time specified by the committee. If the resubmitted report is also unsatisfactory, then the Dissertation shall be rejected summarily. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission by the committee.
- j) If the student's oral presentation is not satisfactory, the committee may defer it and the student has to re-appear for the oral presentation before the same committee for the award of degree.
- k) The Committee should submit Project External examination marks to the Head of the Institution on the day of the examination.

# 8. **Re-Admission / Re-Registration:**

- **8.1. Re-Admission for Discontinued Students:** Students, who have discontinued the M.Tech. Degree Programme due to any reasons whatsoever, may be considered for 'Readmission' into the same Degree Programme (with same specialization) with the Academic Regulations of the Batch into which he gets Re-admitted, with prior permission from the concerned authorities, subject to Item 3.1.
- **8.2. Re-Registration for Detained Students:** When any Student is detained in a Subject (Theory / Practical / Seminar etc. ) due to shortage of attendance in any Semester, he may be permitted to re-register for the same Subject in the 'same category' (Core or Elective Group) or equivalent Subject if the same Subject is not available, as suggested by the Board of Studies of that Department, as when offered in the sub-sequent Semester(s), with the Academic Regulations of the Batch into which he seeks re-registration , with prior permission from the concerned authorities, subject to Item 3.1.

# 9. GRADING PROCEDURE

- **9.1** Marks will be awarded to indicate the performance of each student in each Theory Subject, or Practical, or Mini Project with Seminar, Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.
- **9.2** As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	Letter Grade	<b>Grade Points</b>
90% and above	O (Outstanding)	10
Below 90% but not less than 80%	A <sup>+</sup> (Excellent)	9
Below 80% but not less than 70%	A (Very Good)	8
Below 70% but not less than 60%	$B^+$ (Good)	7
Below 60% but not less than 50%	B (Above Average)	6
Below 50% (< 50%)	F (Fail)	0
Absent	Ab	0

- **9.3** A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Student' in the Semester End Examination (SEE), as and when conduct. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.
- **9.4** If a student not appear for the examinations, 'Absent' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary

Student' for the Semester End Examination (SEE), as and when conducted.

- 9.5 A Letter Grade does not imply any specific % of marks.
- **9.6** In general, a student shall not be permitted to repeat any subject / course (s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement.
- **9.7** A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Audit non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

# Credit Points (CP) = Grade Point (GP) x Credits ... For a Course

- 9.8 The Student passes the subject/course only when he gets  $GP \ge 6$  (B Grade or above).
- **9.9** The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points  $(\Sigma CP)$  secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

# **SGPA** (S<sub>i</sub>) = $\sum$ (C<sub>i</sub> X G<sub>i</sub>) / $\sum$ C<sub>i</sub>

Where  $C_i$  is the number of credits of the i<sup>th</sup> course and  $G_i$  is the grade point scored by the student in the i<sup>th</sup> course.

**9.10** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses in **all** Semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year second semester onwards, at the end of each semester, as per the formula:

 $\mathbf{CGPA} = \sum \left( \mathbf{C_i X S_i} \right) / \sum \mathbf{C_i}$ 

where  $S_i$  is the SGPA of the  $i^{th}$  semester and  $C_i$  is the total number of credits in that semester.

Illustration of calculation of SGPA					Illustration of calculation of CGPA			
Course /Subject	Credits	Letter Grade	Grade Points	Credit Points	Semester	Credits	SGPA	Credits x SGPA
Course 1	3	А	8	24	Sem I	18	7.00	126
Course 2	3	0	10	30	Sem II	18	6.00	108
Course 3	4	$B^+$	7	28	Sem III	16	6.50	104
Course 4	3	В	6	18	Sem IV	16	8.00	128
Course 5	2	$A^+$	9	18				
Course 6	1.5	В	6	09				
Course 7	1.5	0	10	15				
Total	18			142	Total 68		426	
SGPA = 142/18 = 7.89					<b>CGPA</b> = $466/68 = 6.85$			

- **9.11** For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.
- **9.12** For calculations listed in item 9.7 to 9.11, performance in failed subjects/courses (securing '**F**' grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations.

# **10. DECLARATION OF RESULTS**

**10.1** Computation of SGPA and CGPA are done using the procedure in item Nos. 9.6 to 9.9.

**10.2** For final percentage of marks equivalent to the computed final CGPA, the following formula may be used:

# Percentage of Marks = (final CGPA – 0.5) x 10

# 11 AWARD OF DEGREE

**11.1** After a student has satisfied the requirement prescribed for the completion of the Program and is eligible for the award of M.Tech. Degree he shall be placed in one of the following four classes based on CGPA:

Class Awarded	CGPA	Remarks				
First Class with Distinction	$\geq$ 7.75	From the aggregate marks				
First Class	6.75≤ CGPA < 7.75	secured from 68 credits for				
Second Class	$6.00 \leq \text{CGPA} < 6.75$	regular students				

A student with final CGPA (at the end of the **PGP**) < 6.00 shall not be eligible for the Award of Degree.

- **11.2** First Class with Distinction will be awarded to those students who clear all the subjects in single attempt during his/her regular course of study by fulfilling the following conditions:
  - 11.2.1 Should have passed all the subjects/courses in 'first appearance' within the first 2 academic years (or 4 sequential semesters) for M.Tech.
  - 11.2.2 Should have secured a CGPA  $\geq$ 7.75, at the end of each of the 4 sequential semesters.
  - 11.2.3 Should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**First Class with Distinction**'.
- **11.3** Award of Medals: Students fulfilling the conditions listed under item 11.2 alone will be eligible for award of 'College ranks' and 'Medals'.
- **11.4 Transcripts:** After successful completion of prerequisite credits for the award of degree a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

# 12 WITH HOLDING OF RESULTS

If the student has not paid the fee to college at any stage, or has dues pending against his/her name due to any reason what so ever, or if any case of indiscipline is pending against him/her, the result of the student may be withheld, and he/she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

# **13 SUPPLEMENTARY EXAMINATIONS**

Supplementary examinations for odd semester subject(s) / course (s) shall be conducted along with even semester regular examinations and vice versa.

# 14. TRANSITORY REGULATIONS

A Student - who has discontinued for any reason, or who has been detained for want of attendance as specified, or who has failed after having undergone PGP, may be considered

eligible for readmission to the same PGP with same set of Subjects/ Courses (or equivalent Subjects/ Courses as the case may be), and same Professional Electives (or from same set/category of Electives or equivalents as suggested), as and when they are offered (within the time-frame of 4 years from the Date of Commencement of his I Year I Semester).

# **15. STUDENT TRANSFERS**

There shall be no transfers from other colleges/streams.

# 16 RULES OF DISCIPLINE

- **16.1** Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.
- **16.2** When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.
- **16.3** When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).
- **16.4** When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

# **17. MALPRACTICE**

- **17.1 Malpractice Prevention Committee:** The committee shall examine the student's malpractice and indiscipline cases occurred, while conducting the examinations and recommend appropriate punishment to the Academic Council after taking explanation from the student and concerned invigilator as per the malpractice rules mentioned below. The committee consists of
  - a) Controller of Examinations Chairman
  - b) Addl. Controller of Examinations.- Convener
  - c) Subject Expert Member
  - d) Head of the Department of which the student belongs to Member
  - e) The Invigilator concerned Member
- **17.2** Malpractice Rules: Disciplinary action for improper conduct in examinations

<b>S.</b>	<b>Nature of Malpractices / Improper</b>	Punishment
No.	Conduct	
<u>No.</u> 1(a)	Conduct 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	Expulsion from the examination hall and cancellation of the performance in that subject only.
	of the candidate which can be used as	
	an aid in the subject of the examination)	

1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
3	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 practical's 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 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, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of 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 examinations. 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.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / any officer on duty or misbehaves or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that

	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 addl. Controller of examinations 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 addl. Controller of examinations, 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.	subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
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 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/year. The candidate is also debarred and forfeits the seat. Person(s) who do not

		belong to the College will be handed over to police and, a police case will be registered against them.
10	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/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

# **18. SCOPE**

- i) The academic regulations should be read as a whole, for the purpose of any interpretation.
- ii) The above mentioned rules and regulations are applicable in general to M.Tech., unless and otherwise specific.
- iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

# **19. REVISION AND AMENDMENTS TO REGULATIONS**

The Academic Council may revise or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Academic Council Authorities.

# **COURSE STRUCTURE**

# M.Tech. (Computer Science & Engineering) – R20 Course Structure (Applicable from the batch admitted during 2020-21 and onwards)

	I – Semester								
S.	Course	Subject	Ho	ours I Weel	Per	dits	Scheme of Evaluation		
No	Code		т	т	Р	Cre	Maximum Marks		
			L	I			Int.	Ext.	Tot.
1	20CSPC101	Advanced Data Structures	3	0	0	3	30	70	100
2	20CSPC102	Machine Learning	3	0	0	3	30	70	100
3	Professional	Elective-1:	3	0	0	3	30	70	100
	20CSPE101	Information Security							
	20CSPE102	Mobile Application Development							
	20CSPE103	Web & Database Security							
4	<b>Professional</b>	Elective-2 :	3	0	0	3	30	70	100
	20CSPE104	Digital Marketing							
	20CSPE105	Distributed Systems							
	20CSPE106	Parallel Computing							
5	20CSPC103	Advanced Data Structures Lab	0	0	4	2	30	70	100
6	20CSPC104	Machine Learning Lab	0	0	4	2	30	70	100
7	20MC101	Research Methodology and IPR	2	0	0	2	30	70	100
	Audit Course	e -1	2	0	0	0	100	-	100
0	20AC101	English for Research Paper Writing							
0	20AC102	Value Education							
	20AC103	Constitution of India							
		TOTAL	16	0	8	18	310	490	800

	II – Semester								
S.	Course	C-1.1	Ho	ours l Weel	Per K	dits	Scheme of Evaluation		
No.	Code	Subject	т	т	р	re	Maximum Marks		
			L	L	L		Int.	Ext.	Tot.
1	20CSPC201	Advanced Algorithms	3	0	0	3	30	70	100
2	20CSPC202	Data Sciences	3	0	0	3	30	70	100
3	<b>Professional</b>	Elective -3	3	0	0	3	30	70	100
	20CSPE201	Software Project Management							
	20CSPE202	Natural Language Processing							
	20CSPE203	Cyber Security							
4	Professional Elective -4		3	0	0	3	30	70	100
	20CSPE204	Artificial Intelligence							
	20CSPE205	Blockchain Technology							
	20CSPE206	Computer Forensics							
5	20CSPC203	Advanced Algorithms Lab	0	0	4	2	30	70	100
6	20CSPC204	Data Sciences Lab	0	0	4	2	30	70	100
7	20CSPR201	Mini Project with Seminar	0	0	4	2	30	70	100
8	Audit Course	-2	2	0	0	0	100	-	100
	20AC201	Pedagogy Studies							
	20AC202	Stress Management by yoga							
	20AC203	Personality Development through	]						
		Life Enlightenment Skills							
		TOTAL	14	0	12	18	310	490	800

III – Semester									
S. No	Course Code	Subject	Hours Per Week			dits	Scheme of Evaluation		
			т	т	Р	Cre	Maximum Marks		
			L	1	1		Int.	Ext.	Tot.
1	Professional Elective -5			0	0	3	30	70	100
	20CSPE301	Internet of Things							
	20CSPE302	Ethical Hacking							
	20CSPE303	Virtual Reality and Augmented Reality							
2	Open Elective			0	0	3	30	70	100
	20MEOE301	Composite Materials							
	20CEOE302	Construction Management							
	20ECOE303	VLSI Design							
	20CSOE304	Data Mining and Analytics							
3	20CSPR301	Project – I / Dissertation Phase -I	0	0	20	10	30	70	100
TOTAL			6	0	20	16	90	210	300

IV – Semester										
S. No.	Course Code	Subject	Hours Per Week			dits	Scheme of Evaluation			
			L	Т	Р	Cre	Maximum Marks			
							Int.	Ext.	Tot.	
1	20CSPR401	Project – II / Dissertation Phase -II	0	0	32	16	30	70	100	
TOTAL				0	32	16	30	70	100	

Total Credit for the Programme PG Credits: = 18+ 18+16+16 = 68

# I-M.TECH.-I-SEMESTER SYLLABUS

# ADVANCED DATA STRUCTURES

#### I-M.Tech.-I-Sem. Course Code: 20CSPC101

L T P C 3 0 0 3

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

- 1. outlines the functionality of symbol table using hashing techniques
- 2. illustrate the uses of skip lists
- 3. analyze various tree data structures
- 4. develop algorithms for text processing applications
- 5. identify suitable data structures and algorithms for computational geometry problems

#### UNIT - I

Dictionaries: Definition, Dictionary, Abstract Data Type, Implementation of Dictionaries.

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

#### UNIT - II

**Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists.

# UNIT - III

Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

# UNIT - IV

**Text Processing:** Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem

#### UNIT - V

**Computational Geometry:** One Dimensional Range Searching, Two-Dimensional Range Searching, constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees. Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

- 1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
- 2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

# MACHINE LEARNING

#### I-M.Tech.-I-Sem. Course Code: 20CSPC102

L T P C 3 0 0 3

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

- 1. outline the functionalities of machine learning
- 2. analyze the decision tree learning and artificial neural networks
- 3. develop Bayesian and computational learning approaches
- 4. demonstrate instance-based learning algorithms
- 5. illustrate the learning set concepts

#### Unit-I

**Introduction:** Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning; Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search; Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Inductive bias.

#### Unit-II

**Decision Tree learning:** Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning.

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Perceptions, Multilayer networks and the Back propagation algorithm.

#### Unit-III

**Bayesian learning:** Introduction, Bayes theorem, Concept learning, Maximum likelihood and least squared error hypotheses, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, Bayesian belief networks ,The EM algorithm.

**Computational learning theory:** Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite and infinite Hypothesis Space, The mistake bound model of learning.

#### Unit-IV

**Instance-Based Learning:** Introduction, k-Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning.

#### Unit-V

**Learning Sets of Rules:** Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution.

#### **Textbooks:**

- 1. Machine Learning Tom M. Mitchell, TMH.
- 2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

- 1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge University Press.
- 2. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
- 3. Machine Learning by Peter Flach, Cambridge.

# INFORMATION SECURITY (Professional Elective – 1)

# I-M.Tech.-I-Sem. Course Code: 20CSPE101

L T P C 3 0 0 3

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

- 1. illustrate the concepts of security and cryptography
- 2. demonstrate symmetric and asymmetric key cryptographic algorithms
- 3. make use of hash functions and message authentication codes
- 4. interpret email and IP security mechanisms
- 5. outline transport level and wireless security methods

# Unit-I

**Security Concepts:** Introduction to Information security, the need for security, Principles of security, Types of Security attacks, Security Mechanisms, A model for Network Security.

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size.

# Unit-II

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, Block cipher modes of operations, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Knapsack Algorithm.

# Unit-III

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512). **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

# Unit-IV

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations.

#### Unit-V

**Transport-level Security:** Web security considerations, Secure Socket Layer, Transport Layer Security, HTTPS, Mobile device security, WI-FI security.

#### **Textbooks:**

- 1. Cryptography and Network Security Principles and Practice: William Stallings, Pearson, 6/e.
- 2. Cryptography and Network Security: Atul Kahate, TMH, 3<sup>rd</sup> Edition.

- 1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
- 2. Network Security: Forouzan Mukhopadhyay, TMH, 3rd Edition.
- 3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

#### MOBILE APPLICATION DEVELOPMENT (Professional Elective – 1)

#### I-M.Tech.-I-Sem. Course Code: 20CSPE102

L T P C 3 0 0 3

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

- 1. illustrate the working of Android OS
- 2. develop Android user interfaces
- 3. demonstrate the uses of intents and broadcasts
- 4. perceive persistent storage system
- 5. make use of database systems for android applications

# UNIT - I

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

# UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring units, Layouts – Linear, Relative, Grid and Table Layouts, User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, Event Handling – Handling clicks or changes of various UI components, Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

#### UNIT - III

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS, Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity, Notifications – Creating and Displaying notifications, Displaying Toasts

#### UNIT - IV

**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

#### UNIT - V

**Database:** Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

#### **Textbooks:**

- 1. Professional Android 4 Application Dnetwork evelopment, Reto Meier, Wiley India, (Wrox), 2012
- 2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

#### **References:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

# WEB & DATABASE SECURITY (Program Elective – 1)

# I-M.Tech.-I-Sem. Course Code: 20CSPE103

L T P C 3 0 0 3

**Course Outcomes:** After completion of course, students would be able to:

- 1. perceive basics of security and related issues
- 2. analyze various biometric techniques used in today's world
- 3. illustrate the mechanisms for transport and network security
- 4. categorize security issues in web
- 5. demonstrate various biometric authentication schemes.

#### UNIT – I

Data security: Review of cryptography. Examples RSA, DES, ECC.

# UNIT – II

Authentication, non-repudiation and message integrity. Digital signatures and certificates. Protocols using cryptography (example Kerberos). Attacks on protocols

# UNIT - III

**Network security:** Firewalls, Proxy-Servers, Network intrusion detection. **Transport security:** Mechanisms of TLS, SSL, IPSec.

# UNIT - IV

**Web security** – SQL injection, XSS, etc. Software security and buffer overflow. Malware types and case studies. Access Control, firewalls and host/network intrusion detection.

#### UNIT - V

**Other topics:** Biometric authentication, Secure E-Commerce (ex. SET), Smart Cards, Security in Wireless Communication. Recent trends in IOT security, IDS and Biometric.

- 1. W. R. Cheswick and S. M. Bellovin. Firewalls and Internet Security. Addison Wesley, 1994.
- 2. W. Stallings. Cryptography and Network Security. Prentice Hall, 1999.
- 3. B. Schneier. Applied Cryptography. Wiley, 1999.

#### DIGITAL MARKETING (Professional Elective – 2)

# I-M.Tech.-I-Sem. Course Code: 20CSPE104

L T P C 3 0 0 3

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

- 1. outline the importance of digital marketing
- 2. make use of search engine optimization to achieve business goals
- 3. adapt social media for business promotion
- 4. identify link building techniques for content consideration
- 5. interpret digital marketing techniques in real time applications

#### **Unit-I: Introduction**

Introduction: digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites.

# Unit-II: Search Engine Optimization (SEO)

Introduction, writing the SEO content – title, meta tags, image tags, html tags, content writing essentials, Google adwords, Google adsense, Google webmaster tools, on and off page optimization, web crawlers, keyword strategy; SEO friendly website design, hosting & integration.

#### Unit-III: Social media in business

Wikipedia, Facebook, Instagram, LinkedIn, Google – advertising, analytics, ads visibility, bulk emailing essentials, integration of social media buttons into business website.

Campaign budgeting, cost control, resource planning, strengthen your brand, Generate leads, Get more visibility online, Connect with your audience, link exchange, registering with directories, data visualization.

#### Unit-IV: Link building and content consideration

Precursors to link building, elements of link building, finding your competition, analyzing your competition, competitor tracking, becoming a resource, content duplication, content verticals, sitemaps.

#### **Unit-V: Applications**

Travel portal - Makemytrip, Yatra, IRCTC; E-commerce – Amazon, flipkart; Song portals – Wynk.

#### **Textbooks:**

- 1. Jerkovic, John I. SEO warrior: essential techniques for increasing web visibility. "O'Reilly Media, Inc.", 2009.
- 2. The Art of SEO: Mastering Search Engine Optimization Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola; O'Reilly Media

#### **References:**

1. SEO: Search Engine Optimization Bible Jerri L. Ledford; Wiley India; 2nd Edition.

#### DISTRIBUTED SYSTEMS (Professional Elective -2)

#### I-M.Tech.-I-Sem. Course Code: 20CSPE105

L T P C 3 0 0 3

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

- 1. perceive basic principles and architectures of distributed systems
- 2. illustrate time synchronization and coordination techniques
- 3. elaborate various inter process communication techniques
- 4. explain distributed file, name services and shared memory systems
- 5. apply concurrency control techniques for distributed transactions

#### Unit-I

**Characterization of Distributed Systems:** Introduction, Examples of Distributed systems, Resource sharing and the web, Challenges.

System models: Introduction, Architectural and Fundamental Models.

#### Unit-II

**Time and Global States:** Introduction, Clocks, Events and Process states, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States.

**Coordination and Agreement:** Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems.

#### Unit-III

**Inter process Communication:** Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication.

**Distributed objects and Remote Invocation**: Introduction, Communication between Distributed Objects, RPC, Events and Notifications.

#### Unit-IV

**Distributed File Systems:** Introduction, File Service Architecture, SUN Network File System, The Andrew File System.

Name Services: Introduction, Name Services and the Domain Name System, Global Name Services.

**Distributed Shared Memory:** Introduction, Design and Implementation Issues, Sequential Consistency and IVY, Release consistency and Munin.

#### Unit-V

**Transactions and Concurrency Control:** Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.

**Distributed Transactions:** Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

#### **Textbooks:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 4<sup>th</sup> Edition, 2009.

- 1. Distributed Systems: Principles and Paradigms, Andrew S. Tanenbaum and Maarten Van. Steen, 2<sup>nd</sup> Edition, PHI.
- 2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman and Hall, CRC, Taylor & Francis Group, 2007.

# PARALLEL COMPUTING (Professional Elective -2)

# I-M.Tech.-I-Sem. Course Code: 20CSPE106

L T P C 3 0 0 3

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

- 1. perceive the concepts of parallel architectures
- 2. identify the data structures that efficiently model the information in a problem
- 3. develop an efficient parallel algorithm to solve it
- 4. demonstrate the dense matrix algorithms
- 5. solve real time problems using graph algorithms

# UNIT - I

Parallel Computing: Introduction, Motivation and scope - Parallel Programming Platforms – Basic Communication Operations

# UNIT - II

Principles of Parallel Algorithm Design, Analytical Modelling of Parallel Programs

# UNIT - III

Programming using Message Passing Paradigm(MPI), Programming Shared Address Space Platforms (PThreads)

# UNIT - IV

Dense Matric Algorithms ( Matrix-Vector Multiplication , Matrix-Matrix Multiplication) Sorting Algorithms ( Issues, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

#### UNIT - V

Graph Algorithms ( Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm ) Search Algorithms ( DFS, BFS)

#### **Textbooks:**

**1.** Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

- 1. Parallel Computing Theory and Practice, Second Edition, Michaek J. Quinn, Tata McGraw-Hill Edition.
- 1. Parallel Computers Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI

# ADVANCED DATA STRUCTURES LAB

#### I-M.Tech.-I-Sem. Course Code: 20CSPC103

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

- 1. select the data structures that efficiently model the information in a problem
- 2. assess efficiency trade-offs among different data structure implementations or combinations
- 3. identify algorithms for sorting and pattern matching
- 4. develop the programs using a variety of data structures, including hash tables
- 5. classify various tree structures

# **List of Programs:**

- 1. Write a program to perform the following operations:
  - a) Insert an element into a binary search tree.
  - b) Delete an element from a binary search tree.
  - c) Search for a key element in a binary search tree.
- Write a program for implementing the following sorting methods:a) Merge sortb) Heap sortc) Quick sort
- 3. Write a program to perform the following operations:
  - a) Insert an element into a B- tree.
  - b) Delete an element from a B- tree.
  - c) Search for a key element in a B- tree.
- 4. Write a program to perform the following operations:
  - a) Insert an element into a Min-Max heap
  - b) Delete an element from a Min-Max heap
  - c) Search for a key element in a Min-Max heap
- 5. Write a program to perform the following operations:
  - a) Insert an element into a Lefiist tree
  - b) Delete an element from a Leftist tree
  - c) Search for a key element in a Leftist tree
- 6. Write a program to perform the following operations:
  - a) Insert an element into a binomial heap
  - b) Delete an element from a binomial heap.
  - c) Search for a key element in a binomial heap
- 7. Write a program to perform the following operations:
  - a) Insert an element into a AVL tree.
  - b) Delete an element from a AVL search tree.
  - c) Search for a key element in a AVL search tree
- 8. Write a program to perform the following operations:
  - a) Insert an element into a Red-Black tree.
  - b) Delete an element from a Red-Black tree.
  - c) Search for a key element in a Red-Black tree.

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#### L T P C 0 0 4 2

- 9. Write a program to implement all the functions of a dictionary using hashing.
- 10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
- 11. Write a program for implementing Brute Force pattern matching algorithm.
- 12. Write a program for implementing Boyer pattern matching algorithm.

# **Textbooks:**

- Fundamentals of Data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2<sup>nd</sup> Edition, Universities Press
- 2. Data Structures Using C A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
- 3. Introduction to Data Structures in C, Ashok Kamthane, 1<sup>st</sup> Edition, Pearson.

- 1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
- 2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
- 3. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2<sup>nd</sup> Edition, Cengage Learning

# MACHINE LEARNING LAB

#### I-M.Tech.-I-Sem. Course Code: 20CSPC104

L T P C 0 0 4 2

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

- 1. illustrate the implementation procedures for the machine learning algorithms
- 2. demonstrate the ID3 classification algorithms
- 3. analyze the Back propagation Classification algorithm using artificial neural networks
- 4. apply the Bayesian and K-NN machine learning algorithms
- 5. identify the regression algorithms to solve real world problems

# List of Experiments

- 1. Implement and demonstrate the **FIND-S algorithm** for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
- 2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm** to output a description of the set of all hypotheses consistent with the training examples.
- 3. Write a program to demonstrate the working of the decision tree based **ID3** algorithm. Use an appropriate data set for building the **decision tree** and apply this knowledge to classify a new sample.
- 4. Write a Python program to implement **CART** (Classification and Regression Trees)
- 5. Build an Artificial Neural Network by implementing the **Back propagation algorithm** and test the same using appropriate data sets.
- 6. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
- 7. Write a Python program for **Outlier Detection**.
- 8. Write a program to construct a **Bayesian network** considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
- 9. Apply **EM algorithms** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using **k-Means algorithm.** Compare the results of these two algorithms and comment on the quality of clustering.
- 10. Write a program to implement **k-Nearest Neighbor algorithm** to classify the iris data set. Print both correct and wrong predictions.
- 11. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
- 12. Write a Python program to demonstrate First Order Logic.

#### **Textbooks:**

- 1. Machine Learning Tom M. Mitchell, TMH.
- 2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

- 1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge University Press.
- 2. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
- 3. Machine Learning by Peter Flach, Cambridge

# **RESEARCH METHODOLOGY AND IPR**

#### I-M.Tech.-I-Sem. Course Code: 20MC101

L T P C 2 0 0 2

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

- 1. formulate research problem
- 2. analyze research related information
- 3. follow research ethics
- 4. perceive nature of IPR and its development.
- 5. Outline the patent rights

# UNIT –I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

# UNIT - II

Effective literature studies approaches, analysis Plagiarism, Research ethics.

# UNIT - III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

#### UNIT - IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

#### UNIT - V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

- 1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students""
- 2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- 3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- 4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- 5. Mayall, "Industrial Design", McGraw Hill, 1992.
- 6. Niebel, "Product Design", McGraw Hill, 1974.
- 7. Asimov, "Introduction to Design", Prentice Hall, 1962.
- 8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.

#### ENGLISH FOR RESEARCH PAPER WRITING (AUDIT COURSE - 1)

# I-M.Tech.-I-Sem. Course Code: 20AC101

L T P C 2 0 0 0

**OUTCOME:** Upon completion of the course, the students will be able to

- 1. determine that how to improve your writing skills and level of readability
- 2. Learn about what to write in each section
- 3. determine the skills needed when writing a Title Ensure the good quality of paper at very firsttime submission

# UNIT- I

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

# UNIT- II

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

# UNIT-III

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

# UNIT- IV

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

#### UNIT- V

**Skills are needed when writing the methods**, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

# UNIT- VI

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

- 1. Goldbort R Writing for Science, Yale University Press (available on Google Books)
- 2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press
- 3. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
- 4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

# VALUE EDUCATION (AUDIT COURSE - 1)

# I-M.Tech.-I-Sem. Course Code: 20AC102

L T P C 2 0 0 0

**OUTCOME:** Upon completion of the course, the students will be able to

- 1. Knowledge of self-development
- 2. Learn the importance of Human values
- 3. Developing the overall personality

# UNIT- I

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism., Moral and non- moral valuation. Standards and principles, Value judgements

# UNIT- II

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity. Power of faith, National Unity, Patriotism. Love for nature , Discipline

# UNIT- III

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

# UNIT- IV

Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively.

# **REFERENCE:**

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

#### CONSTITUTION OF INDIA (AUDIT COURSE - 1)

# I-M.Tech.-I-Sem. Course Code: 20AC103

L T P C 2 0 0 0

**OUTCOME:** Students will be able to:

- 1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- 2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

# UNIT- I

**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working), Preamble Salient Features

# UNIT- II

**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- III

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

# UNIT-IV

**Local Administration:**District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayat Raj: Introduction, PRI: Zilla Pachayat., lected officials and their roles, CEO Zilla Pachayat: Position and role., Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

#### UNIT- V

**Election Commission:** Election Commission: Role and Functioning., Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

#### **REFERENCE:**

- 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.
- 4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

# I-M.TECH.-II-SEMESTER SYLLABUS

# ADVANCED ALGORITHMS

#### I-M.Tech.-II-Sem. Course Code: 20CSPC201

L T P C 3 0 0 3

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

- 1. design and apply iterative and recursive algorithms
- 2. develop applications using graph algorithms
- 3. outline various divide and conquer approaches
- 4. analyze the performance of various transform and dynamic algorithms
- 5. demonstrate various string-matching algorithms

# UNIT - I

Classification of algorithms, Algorithm Specifications, Mathematical analysis of Recursive Algorithms

Introduction to recurrence equations, formulation of recurrence equations, Techniques for solving recurrence equations, Solving Recurrence Equations using polynomial reduction, Divide and conquer recurrences

# UNIT - II

**Graphs:** Graph representations, Graph traversals, **Brute Force Approaches:** Computational Geometry Problems-Closest pair problem, Convex Hull Problem, Exhaustive Searching- Magic Squares problem, Container Loading problem, Knapsack Problem, Assignment Problem

# UNIT - III

**Divide and Conquer approach:** Multiplication of long integers, Strassen's matrix multiplication, Fourier Transform, Greedy algorithms: Coin change problem, Scheduling problems, knapsack problem, optimal storage on tapes, optimal tree problems, optimal graph problems

#### UNIT - IV

**Transform and Conquer approach:** Matrix operations- Gaussian Elimination method, LU decomposition, Crout's method of decomposition

**Dynamic Programming:** Computing binomial coefficients, Multistage graph problem, Transitive Closure and Warshall algorithm, Floyd warshall all pairs shortest path problem, TSP, Flow shop scheduling algorithm

#### UNIT - V

**String algorithms:** Basic string algorithms, Longest Common Subsequences. Linear Programming, Graphical method for solving LPP, Simplex method, Minimization problems, Principle of Duality, Max Flow problem

#### Textbook:

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

- 1. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
- 2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
- 3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.

# DATA SCIENCES

#### I-M.Tech.-II-Sem. Course Code: 20CSPC202

L T P C 3 0 0 3

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

- 1. explain fundamentals of data sciences
- 2. build data science applications using Python based toolkits
- 3. outline the mathematical foundations of data science
- 4. demonstrate ethical issues of data science applications
- 5. make use of data science in real time applications

#### **Unit-I: Introduction to Data Sciences**

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs reporting. Data Science in business, open source tools.

#### **Unit-II: Introduction to Programming Tools for Data Science**

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

#### **Unit-III: Mathematical Foundations**

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P- hacking, Bayesian Inference.

### **Unit-IV: Data Science and Ethical Issues**

Discussions on privacy, security, ethics - a look back at data science - next-generation data scientists; unfair discrimination, reinforcement of human biases, lack of transparency, standards, policies, compliance, regulations, rules.

#### **Unit-V: Case Studies**

Weather forecasting, stock market prediction, object recognition, real time sentiment analysis.

#### **Textbooks:**

- 1. Introduction to data science by Igual, Laura & Seguí, Santi, Springer.
- 2. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
- 3. The Data Science Handbook, Field Cady, Wiley, 2017.

- 1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
- 2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
- 3. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

# SOFTWARE PROJECT MANAGEMENT (Professional Elective – 3)

# I-M.Tech.-II-Sem. Course Code: 20CSPE201

L T P C 3 0 0 3

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

- 1. outline the concepts of software management and economics
- 2. illustrate artifacts and life cycle phases
- 3. design various workflows and process planning
- 4. adapt project organization, process automation and control
- 5. apply contemporary software project management practices for future

# Unit-I

**Conventional Software Management:** Waterfall model, Conventional software, Management performance.

**Evolution of Software Economics**: Software economics, Pragmatic software cost estimation, the old way and new way.

# Unit-II

Life Cycle Phases: Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase.

Artifacts of the process: Management artifacts, engineering artifacts and pragmatic artifacts, model based architecture.

# Unit-III

Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessment.

**Process Planning:** Work breakdown structures, Planning guidelines, cost and schedule estimating process, Pragmatic planning.

#### Unit-IV

**Project Organizations**: Line-of-business organizations, project organizations, evolution of organizations, Round trip engineering, change management.

**Project Control and process instrumentation:** The seven core metrics, management indicators, quality indicators, life-cycle expectations, pragmatic software metrics and metrics automation.

#### Unit-V

**Future Software Project Management Practices:** Tailoring the process: Process Discriminants, Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

#### **Textbooks:**

1. Software Project Management, Walker Royce, Pearson Education.

- 1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw Hill Edition.
- 2. Software Project Management, Joel Henry, Pearson Education.
- 1. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005

#### NATURAL LANGUAGE PROCESSING (Professional Elective – 3)

#### I-M.Tech.-II-Sem. Course Code: 20CSPE202

L T P C 3 0 0 3

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

- 1. explain fundamentals of NLP and morphology
- 2. demonstrate word level statements and syntactic analysis
- 3. make use of context free grammar and parsing techniques
- 4. apply semantic analysis techniques to solve various problems
- 5. illustrate language generation and discourse analysis

#### **Unit-I: Overview and Morphology**

**Introduction:** Models and Algorithms - Regular Expressions - Basic Regular Expression Patterns - Finite State Automata.

**Morphology:** Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing -Porter Stemmer.

#### **Unit-II: Word Level and Syntactic Analysis**

N-grams Models of Syntax - Counting Words - Unsmoothed N- grams, Smoothing- Backoff Deleted Interpolation – Entropy - English Word Classes - Tagsets for English, Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

#### **Unit-III: Context Free Grammars and Parsing**

Context Free Grammars for English Syntax- Context- Free Rules and Trees – Sentence- Level Constructions– Agreement – Sub Categorization

Parsing – Top-down – Earley Parsing - feature Structures – Probabilistic Context-Free Grammars.

# **Unit-IV: Semantic Analysis**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus; Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer; Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval

#### **Unit-V: Language Generation and Discourse Analysis**

Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence; Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents – Language Generation – Architecture - Surface Realizations - Discourse Planning; Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches.

#### **Textbooks:**

- 1. Speech and Language Processing, Daniel Jurafsky and James H. Martin, , Prentice Hall; 2<sup>nd</sup> Edition, 2008.
- 2. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999.

#### **Reference:**

1. James Allen, Natural Language Understanding, Addison Wesley; 2<sup>nd</sup> Edition,

# **CYBER SECURITY** (Professional Elective – 3)

# I-M.Tech.-II-Sem. Course CodE: 20CSPE203

L T P C 3 0 0 3

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

- 1. explain cyber security terminologies
- 2. identify various cyber offences
- 3. apply various tools and methods to control cybercrime
- 4. make use of standards and cyber laws to enhance cyber security
- 5. illustrate the importance of security policies & IT Act

# **Unit-I: Introduction**

Essential Terminologies: NIA, Risks, Breaches, Threats, Attacks, Exploits. Information gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port scanners, Network scanners. Forming an incident response team, Reporting crime, Operating System attacks, Application attacks, Reverse engineering, Cracking techniques and Financial frauds.

#### **Unit-II: Cyber Offences**

Introduction, how criminals plan the attacks, social engineering, cyber stalking, cyber cafe and cybercrimes, Botnets: The fuel for cybercrime, attack vector, cloud security.

# Unit-III: Tools and Methods Used in Cybercrime

Introduction, proxy servers and anonymizers, phishing, password cracking, keyloggers and spywares, virus and worms, DoS and DDoS attacks, SQL injection, buffer overflow.

Trojan horse and backdoors, steganography.

#### **Unit-IV: Cyber Security Audit & Standards**

Risk assessment and management, asset classification, crisis management plan, resources recovery strategy, security testing, international standards, analysis and logging, security certification.

#### **Unit-V: Security Policy & IT ACT**

Security policies, why policies should be developed, WWW policies, email security policies, policy review process- corporate policies, sample security policies, publishing and notification requirement of the policies. Information Security Standards-ISO, cyber laws in India; IT Act 2000 provisions, Intellectual Property Law: Copy right law, software license, semiconductor law and patent law.

#### **Textbooks:**

- 1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA
- 2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, TMH.

- 1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson.
- 2. Schou, Shoemaker, "Information Assurance for the Enterprise", TMH.
- 3. Chander, Harish," Cyber Laws And It Protection", PHI, New Delhi, India

#### ARTIFICIAL INTELLIGENCE (Professional Elective – 4)

#### I-M.Tech.-II-Sem. Course Code: 20CSPE204

L T P C 3 0 0 3

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

- 1. explain the concepts of artificial intelligence
- 2. illustrate various search algorithms
- 3. adapt various probabilistic reasoning approaches
- 4. elaborate Markov decision process
- 5. perceive various reinforcement learning approaches

#### **Unit-I: Introduction**

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

#### **Unit-II: Search Algorithms**

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A\* algorithm, Game Search.

# **Unit-III: Probabilistic Reasoning**

Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference.

Temporal Model, Hidden Markov Model.

#### **Unit-IV: Markov Decision Process**

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

#### **Unit-V: Reinforcement Learning**

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

#### **Textbooks:**

- 1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3<sup>rd</sup> Edition, TMH, 2008.
- 2. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003.

- 1. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
- 2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.
- 3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010

#### BLOCKCHAIN TECHNOLOGY (Professional Elective – 4)

#### I-M.Tech.-II-Sem. Course Code: 20CSPE205

L T P C 3 0 0 3

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

- 1. explain the fundamentals of Blockchain techniques
- 2. analyze various consensus problems
- 3. adapt Blockchain technology to improve business
- 4. make use of Ethereum frameworks to write smart contract
- 5. interpret Blockchain technology in real time applications

#### Unit-I

**Introduction:** What is Blockchain, the business backdrop, the problem area, Relation to bitcoin, Requirements for Blockchain in a business environment, Requirements deep dive, Leverage Blockchain benefits, why Blockchain is relevant for business.

**Consensus**: shared reference data example, Provenance: supply chain example, Immutability: audit and compliance example, Finality: letter of credit example, Industry use cases, Customer adoption.

# Unit-II

**The Consensus Problem (Cryptocurrency):** Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for Blockchain - Garay model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

#### Unit-III

**Transform your Business with Blockchain:** IBM and Hyperledger relationship: Blockchain for business, Hyperledger Composer, Public references, IBM engagement model, Set up the Hyperledger Composer Playground, Transfer assets in a Blockchain network, Explore editor views archive data. Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.

#### **Unit-IV**

**Ethereum:** Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts.

#### Unit-V

**Trends and Topics:** Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.

#### **Textbook:**

1. Narayanan, Arvind, et al. Bitcoin and cryptocurrency technologies: A comprehensive introduction. Princeton University Press, 2016.

- 1. Vigna, Paul, and Michael J. Casey. The Truth Machine: The Blockchain and the Future of Everything. Picador, 2019.
- 2. Gerard, David. Attack of the 50 foot blockchain: Bitcoin, blockchain, Ethereum & smart contracts. David Gerard, 2017.
- 3. De Filippi, Primavera De Filippi. Blockchain and the law: The rule of code. Harvard University Press, 2018

# COMPUTER FORENSICS (Program Elective – 4)

# I-M.Tech.-II-Sem. Course Code: 20CSPE206

L T P C 3 0 0 3

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

- 1. explain the fundamentals of computer forensics
- 2. illustrate the methods for evidence collection and data seizure
- 3. analyze and validate digital forensic evidences
- 4. solve the computer fraud cases by using forensics tools
- 5. make use of various operating systems for computer forensics

#### **Unit-I: Computer Forensics Fundamentals**

Introduction, reporting cybercrime, law enforcement, Human resources, Services, benefits, applications, types of Law Enforcement, Indian Information Technology Act, Computer Forensics Evidence and Capture: Data Back-up and Recovery.

#### **Unit-II: Evidence Collection and Data Seizure**

Importance of Evidence, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Artifacts, Controlling Contamination: The Chain of Custody, Duplication and Preservation of Digital Evidence: Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Evidence, Image Verification and Authentication.

#### Unit-III: Computer Forensics analysis and validation

Determining what data to collect and analyse, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

**Processing Crime and Incident Scenes:** Identifying digital evidence, collecting evidence in privatesector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

#### **Unit-IV: Current Computer Forensic tools**

Evaluating computer forensic tool needs, computer forensics software and hardware tools, validation, E-Mail Investigations.

**Cell phone and mobile device forensics**: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

#### **Unit-V: Working with Windows and DOS Systems**

File systems, Microsoft File Structures, NTFS disks, disk encryption, windows registry, virtual machines.

#### **Textbooks:**

- 1. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi.
- 2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, Cengage Learning.

- 1. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media.
- 2. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade, TMH 2005.

# ADVANCED ALGORITHMS LAB

#### I-M.Tech.-II-Sem. Course Code: 20CSPC203

# L T P C 0 0 4 2

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

- 1. design and apply iterative and recursive algorithms
- 2. develop applications using graph algorithms
- 3. outline various divide and conquer approaches
- 4. analyze the performance of various transform and dynamic algorithms
- 5. demonstarte various string-matching algorithms

# LIST OF EXPERIMENTS

- 1. Implement assignment problem using Brute Force method
- 2. Perform multiplication of long integers using divide and conquer method.
- 3. Implement solution for knapsack problem using Greedy method.
- 4. Implement Gaussian elimination method.
- 5. Implement LU decomposition
- 6. Implement Warshall algorithm
- 7. Implement Rabin Karp algorithm.
- 8. Implement KMP algorithm.
- 9. Implement Harspool algorithm
- 10. Implement max-flow problem.

#### **Textbook:**

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

- 1. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
- 2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
- 1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education

# DATA SCIENCES LAB

#### I-M.Tech.-II-Sem. Course Code: 20CSPC204

L T P C 0 0 4 2

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

- 1. illustrate the implementation procedures for the machine learning algorithms
- 2. demonstrate the ID3 Classification algorithms
- 3. analyze the Back propagation Classification algorithm using Artificial Neural Networks
- 4. apply the Bayesian and K-NN Machine Learning algorithms
- 5. identify the regression algorithms to solve real world problems

# LIST OF EXPERIMENTS (Using Python)

- 1. Write a program to predict the class of the flower based on available attributes.
- 2. Write a program to predict if a loan will get approved or not.
- 3. Write a program to predict the sales of a store.
- 4. Write a program to predict the median value of owner occupied homes.
- 5. Write a program to predict the traffic on a new mode of transport.
- 6. Write a program to predict the class of user.
- 7. Write a program to identify the tweets which are hate tweets and which are not.
- 8. Write a program o predict the age of the person.
- 9. Write a program to predict the height and weight of a person.
- 10. Write a program to predict the time taken to solve a problem given the current status of the user.

#### **Textbooks:**

- 1. Introduction to data science by Igual, Laura & Seguí, Santi, Springer.
- 2. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
- 3. The Data Science Handbook, Field Cady, Wiley, 2017.

- 1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
- 2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
- 3. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

# MINI PROJECT WITH SEMINAR

#### I-M.Tech.-II-Sem. Course Code: 20CSPR201

L T P C 0 0 4 2

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the supervisor

# PEDAGOGY STUDIES (AUDIT COURSE - 2)

#### I-M.Tech.-II-Sem. Course Code: 20AC201

L T P C 2 0 0 0

**OUTCOME:** Students will be able to

- 1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- 2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- 3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy

#### UNIT- I

**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and Terminology, Theories of learning, Curriculum, Teacher education., Conceptual framework, Research questions, Overview of methodology and Searching.

# UNIT- II

**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

# UNIT- III

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school, curriculum and guidance materials best support effective pedagogy?, Theory of change., Strength and nature of the body of evidence for effective pedagogical practices., Pedagogic theory and pedagogical approaches., Teachers' attitudes and beliefs and Pedagogic strategies.

#### UNIT-IV

Professional development: alignment with classroom practices and follow-up, support, Peer support, Support from the head teacher and the community., Curriculum and assessment, Barriers to learning: limited resources and large class sizes

#### UNIT-V.

**Research gaps and future directions :**Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

# **REFERENCE:**

- 1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
- 2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
- 3. Akyeampong K (2003) Teacher training in Ghana does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
- 4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
- 5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
- 6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read'

# STRESS MANGEMENT BY YOGA (AUDIT COURSE - 2)

I-M.Tech.-II-Sem. Course Code: 20AC202

# UNIT-I:

Definitions of Eight parts of yoga. (Ashtanga)

# UNIT-II:

Yam and Niyam.

# UNIT-III:

Do's and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

# **UNIT-IV:**

Asan and Pranayam

# UNIT-V:

- 1. Various yoga poses and their benefits for mind & body
- 2. Regularization of breathing techniques and its effects-Types of pranayam

#### **TEXT BOOKS/ REFERENCES:**

- 1. "Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
- 2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

# PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT COURSE - 2)

I-M.Tech.-II-Sem. Course Code: 20AC203 L T P C 2 0 0 0

# UNIT-I:

**Neetisatakam-Holistic development of personality:** Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)

# **UNIT-II:**

**Neetisatakam-Holistic development of personality** : Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)

# **UNIT-III:**

**Approach to day to day work and duties:** Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

# **UNIT-IV:**

**Statements of basic knowledge**: Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 Personality of Role model.

# UNIT-V:

Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

#### **TEXT BOOKS/ REFERENCES:**

- 1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
- 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

# II-M.TECH.-I-SEMESTER SYLLABUS

#### INTERNET OF THINGS (Professional Elective – 5)

# II-M.Tech.-I-Sem. Course Code: 20CSPE301

L T P C 3 0 0 3

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

- 1. design a portable IoT using Arduino/ equivalent boards and relevant protocols
- 2. develop web services to access/control IoT devices
- 3. analyze applications of IoT in real time scenario
- 4. build state of the art architecture in IoT
- 5. solve real world design constraints in Industrial and Commercial Building Automation

#### **Unit-I: Fundamentals of IoT**

Introduction – Characteristics - Physical design - Logical design - Enabling technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT vs M2M.

#### **Unit-II: IoT Architecture**

M2M high-level ETSI architecture-IETF architecture for IoT-OGC architecture-IoT reference model-Domain model-Information model-functional model-Communication model

#### Unit-III: Building IoT With Raspberry Pi/ Galileo/Arduino

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages –Web service Intel Galileo Gen2 with Arduino – Interfaces - Arduino IDE – Programming-APIs and Hacks

# Unit- IV: IoT & Cloud Server

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

#### **Unit-V: Case Studies and Advanced Topics**

IoT systems management - IoT Design Methodology - Specifications Integration and Application Development. Various Real time applications of IoT-Connecting IoT to cloud–Cloud Storage for IoT – Data Analytics for IoT – Software & Management Tools for IoT

#### **Text Book :**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup> Edition, Academic Press, 2014.

- 1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things -A hands -on approach", niversities Press, 2015, ISBN: 9788173719547
- 2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
- 3. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014
- 4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things–Key applications and Protocols", Wiley, 2012
- 5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

#### ETHICAL HACKING (Professional Elective – 5)

# II-M.Tech.-I-Sem. Course Code: 20CSPE302

L T P C 3 0 0 3

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

- 1. outline the framework and security issues related to ethical hacking
- 2. plan and execute controlled attacks to safeguard the business
- 3. identify security lapses and prepare for an ethical hack
- 4. make use of enumeration and exploitation techniques
- 5. adapt best practices for deliverables and integration for security

#### Unit-I

**Introduction:** Hacking Impacts, the Hacker; **Framework:** Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability, Analysis, Exploitation, Final Analysis, Deliverable, Integration; **Information Security Models:** Computer Security, Network Security, Service Security, Application security, Security Architecture; **Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking.

#### Unit-II

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges.

**Planning for a Controlled Attack:** Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

#### Unit-III

**Preparing for a Hack:** Technical Preparation, Managing the Engagement.

Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

#### Unit-IV

**Enumeration:** Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase.

**Exploitation:** Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password. Crackers, Root Kits, applications, Wardialing, Network, Services and Areas of Concern.

#### Unit-V

**Deliverable**: The Deliverable, the Document, Overall Structure, Aligning Findings, Presentation. **Integration:** Integrating the Results, Integration Summary, Mitigation, Defence Planning, Incident, Management, Security Policy, Conclusion.

#### **Textbook:**

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

- 1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
- 1. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

# VIRTUAL REALITY AND AUGMENTED REALITY (Professional Elective – 5)

#### II-M.Tech.-I-Sem. Course Code: 20CSPE303

L T P C 3 0 0 3

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

- 1. explain fundamental of virtual reality and 3D graphic systems
- 2. adapt geometric modelling in virtual reality environment
- 3. make use of virtual environment for animation and simulation
- 4. illustrate virtual reality hardware and software
- 5. develop virtual reality applications

#### **Unit-I: Introduction to Virtual Reality**

**Virtual Reality and Virtual Environment:** Introduction, computer graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark.

**3D** Computer Graphics: Introduction, The virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, colour theory, simple 3D modelling, illumination models, reflection models, Shading algorithms, radiosity, hidden surface removal, realism-stereographic image.

#### **Unit-II: Geometric Modelling**

**Geometric Modelling:** Introduction, from 2D to 3D, 3D space curves, 3D boundary representation. Geometrical Transformations: Introduction, frames of reference, modelling transformations, instances, picking, flying, scaling the VE, collision detection

Generic VR system: Introduction, Virtual environment, computer environment, VR technology, model of interaction, VR systems.

# **Unit-III: Virtual Environment**

Animating the Virtual Environment: Introduction, The dynamics of numbers, linear and nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system.

**Physical Simulation:** Introduction, objects falling in a gravitational field, rotating wheels, elastic collisions, projectiles, simple pendulum, springs, flight dynamics of an aircraft.

#### **Unit-IV: VR Hardware and Software**

Human factors: Introduction, the eye, the ear, the somatic senses.

**VR Hardware:** Introduction, sensor hardware, head-coupled displays, acoustic hardware, integrated VR systems.

**VR Software:** Introduction, modelling virtual world, physical simulation, VR toolkits, introduction to VRML.

#### **Unit-V: VR Applications**

Introduction, engineering, entertainment, science, training; the future: virtual environment, modes of interaction.

#### **Textbook:**

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007.

#### **References:**

1. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, New Delhi.

2. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000 Ltd.

# COMPOSITE MATERIALS (Open Elective)

#### II-M.Tech.-I-Sem. Course Code: 20MEOE301

L T P C 3 0 0 3

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

- 1. outline the characteristics and effect of reinforcement in composite materials.
- 2. illustrate the various fiber reinforcement properties and its application.
- 3. discuss the manufacturing process of metal matrix composites.
- 4. analyze the various methods for polymer matrix composites.
- 5. determine the various failure of composite materials.

# UNIT-I

**Introduction:** Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

# UNIT – II

**Reinforcements:** Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

# UNIT – III

**Manufacturing of Metal Matrix Composites:** Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

#### UNIT-IV

**Manufacturing of Polymer Matrix Composites:** Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

#### UNIT – V

**Strength:** Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

#### **Text Books:**

- 1. Material Science and Technology Vol 13 Composites by R.W.Cahn VCH, West Germany.
- 2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

#### CONSTRUCTION MANAGEMENT (Open Elective)

#### II-M.Tech.-I-Sem. Course Code: 20CEOE302

L T P C 3 0 0 3

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

- 1. outline basic concepts of planning, strategy implementation and human resource management
- 2. adopt the scientific method of management for various construction projects
- 3. identify the different resources such as manpower, materials, cost and equipment
- 4. elaborate the contract document, specification and billing system
- 5. discuss the labour regulation, administration, accident, safety and legal issues

#### UNIT -I

**Management process**- Roles. Management theories. Social responsibilities. Planning and strategic management. Strategy implementation. Decision making: tools and techniques – Organizational structure. Human resource management- motivation performance- leadership.

#### UNIT-II

**Classification of Construction projects**, Construction stages, Resources- Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data-Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

#### UNIT-III

**Resource planning** - planning for manpower, materials, costs, equipment. Labour, -Scheduling .Forms of scheduling - Resource allocation. budget and budgetary control methods

# UNIT-IV

**Contract** - types of contract, contract document, and specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration . negotiation - M.Book - Muster roll -stores.

#### UNIT-V

**Management Information System** - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction: legal and financial aspects of accidents in construction. occupational and s`afety hazard assessment. Human factors in safety. Legal and financial aspects of accidents in construction. Occupational and safety hazard assessment

- 1. Ghalot, P.S., Dhir, D.M., Construction Planning and Management, Wiley Eastern Limited, 1992.
- 2. Chitkara,K.K.,Construction Project Management,Tata McGraw Hill Publishing Co,Ltd.,New Delhi.
- 3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi.
- 4. Sengupta, B. & Guha, H, Construction Management And Planning by: Tata McGraw-hill publications.

# VLSI DESIGN (Open Elective)

II-M.Tech.-I-Sem. Course Code: 20ECOE303 L T P C 3 0 0 3

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

- 1. interpret various MOS transistor fabrication techniques
- 2. illustrate the operation and electrical characteristics of MOS transistor
- 3. discuss VLSI Design flow, Stick diagrams, layout, design rules of MOS transistor
- 4. outline the basic concepts of MOS circuits
- 5. interpret scaling of MOS transistor and various levels of CMOS testing

#### UNIT -I

**Introduction:** Introduction to IC technology, Basic MOS transistors, Enhancement and depletion modes of transistor action. Fabrication process of NMOS, PMOS, CMOS and Bi-CMOS technology and comparison between CMOS and bipolar technologies.

#### UNIT -II

**Basic Electrical properties of MOS circuits:** Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds. CMOS Inverter analysis and design, Bi-CMOSInverters.MOS Transistor conductance and output conductance, MOS transistor figure of merit, Pass transistors, nMOS inverter , Determination of pull up to pull down ratio for an nMOS inverter driven by another nMOS inverter and for an nMOS inverter driven through one or more pass transistors, Alternate forms of pull up, CMOS inverter, BiCMOS Inverters.

# UNIT-III

**VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2µm CMOS Design rules for wires, Contacts and Transistors.Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

#### UNIT-IV

**Basic concepts of MOS Circuits:** Sheet resistance, Sheet resistance concept applied to MOS transistors and inverters, Area capacitance of layers, standard unit of capacitance, some area capacitance calculations, The delay unit, inverter delays, Driving large capacitance loads, Propagation delays, wiring capacitances, Fan-in and Fan-out characteristics, Choice of layers, CMOS steady state electrical behavior, CMOS dynamic electrical behavior.

#### UNIT-V

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling.

**CMOS Testing:** Need for CMOS testing, design strategies for test Manufacturing test principles, Design for testability (DFT) - Adhoc testing, Scan design, Built in self-test (BIST).

#### Textbooks:

- 1. Essentials of VLSI circuits and systems Kamran Eshraghian, Dougles A. Pucknell, PHI, 2005.
- 2. CMOS VLSI Design A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3<sup>rd</sup> Ed, Pearson, 2009.

- 1. CMOS logic circuit Design John. P. Uyemura, Springer.
- 2. Modern VLSI Design Wayne Wolf, Pearson Education.

#### DATA MINING AND ANALYTICS (Open Elective - I)

# M.Tech. II Year-I Sem Course Code: 20CSOE304

L T P C 3 0 0 3

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

- 1. summarize fundamentals of data mining
- 2. illustrate various mining association rules
- 3. make use of classification and clustering techniques
- 4. outline various data analytics techniques
- 5. solve statistical problems using R programming

# Unit-I

**Introduction to Data Mining:** Kinds of Data, Data mining Functionalities – Interesting Patterns Task Primitives, Issues in Data Mining, Data Preprocessing.

#### Unit-II

**Mining Frequent, Associations and Correlations:** Basic Concepts, Frequent Itemset Mining Methods:, Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, From Association Analysis to Correlation Analysis.

# Unit-III

**Classification:** Basic Concepts, Algorithm for Decision Tree Induction, Attribute Selection Measures. Bayes Classification Methods, Bayesian Belief Networks, a Multilayer Feed-Forward Neural Network, k-Nearest-Neighbor Classifiers.

**Clustering:** Cluster Analysis, Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering.

#### Unit-IV

**Data Definitions and Analysis Techniques:** Introduction to statistical learning and R-Programming, Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing.

#### Unit-V

**Basic Analysis Techniques:** Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Maximum likelihood test, regression, Practice and analysis with R.

#### **Textbooks:**

- 1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
- 2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
- 3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013

- 1. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing
- 2. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
- 3. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer.

# **PROJECT – I / DISSERTATION PHASE – I**

II-M.Tech.-I-Sem. Course Code: 20CSPR301 L T P C 0 0 20 10

Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution.

Continuous assessment of Dissertation - I and Dissertation - II at Mid Sem and End Sem will be monitored by the departmental committee.

# II-M.TECH.-II-SEMESTER SYLLABUS

#### **PROJECT – II / DISSERTATION PHASE – II**

# II-M.Tech.-II-Sem. Course Code: 20CSPR401

L T P C 0 0 3216

Dissertation – II will be an extension of the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.