ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER NETWORKS AND INFORMATION SECURITY (CNIS)

(DEPARTMENT OF INFORMATION TECHNOLOGY)

FOR

M.TECH TWO YEAR DEGREE COURSE

(Applicable for the batches admitted from 2022-2023)

G. Narayanamma Institute of Technology and Science

(for women)

(AUTONOMOUS)

Shaikpet, Hyderabad –500104. T.S.

DEPARTMENT OF INFORMATION TECHNOLOGY

DEPARTMENT VISION

To build a prime transformative learning community that responds swiftly to the challenges of Information Technology.

DEPARTMENT MISSION

To foster an intellectual environment that delivers virtuous Information Technocrats with commitment to industry and society by strengthening the logical, analytical and applicative skills to excel academically and professionally. To inculcate good communication skills in students and introduce them to various codes of professional practices for carrying out effective team collaborations and project management in the field of IT.

G.NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (for WOMEN)
(Autonomous)
Shaikpet, Hyderabad – 500 104

ACADEMIC REGULATIONS (R22)
for CBCS Based M.Tech. Degree Programme (Regular/Full Time PG Course) in

COMPUTER NETWORKS AND INFORMATION SECURITY (CNIS) (DEPARTMENT OF INFORMATION TECHNOLOGY)

(Effective for the students admitted into I year from the
Academic Year 2022-23 and onwards)

1.0 Post-Graduate Degree Programme (PGDP) in Engineering & Technology (E & T)

G. Narayanamma Institute of Technology & Science (GNITS) - for Women, Hyderabad, affiliated to Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, offers 2 Year (4 Semesters) Master of Technology (M. Tech.) Degree Programmes under Choice Based Credit System (CBCS), with effect from the Academic Year 2022 - 23 onwards in the following Branches of Engineering & Technology with the Specializations as listed below:

S.No.	*Branch/ Department*	*Specialization*
I.	Computer Science & Engineering	Computer Science & Engineering
II.	Electrical & Electronics Engineering	Power Electronics & Electric Drives
III.	Electronics & Communication Engineering	Digital Electronics & Communication Engineering
IV.	Electronics & Telematics Engineering	Wireless & Mobile Communications
V.	Information Technology	Computer Networks & Information Security

2.0 Eligibility for Admission

2.1 Admission to the **PGDP** shall be made either on the basis of - the Rank/Percentile earned by the candidate in the relevant qualifying GATE Examination, OR the Merit Rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (PGECET) for M.Tech. Programmes, OR an Entrance Test conducted by the Jawaharlal Nehru Technological University Hyderabad, OR on the basis of any other order of merit approved by the University, subject to the reservations as prescribed by the Government from time to time.

2.2 The medium of instruction for all the PG Programmes shall be ENGLISH only.

3.0 M.Tech. Degree Programme Structure

3.1 All M.Tech. Programmes at GNITS are of the Semester Pattern with 4 Semesters constituting 2 Academic Years, and each Academic Year has TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations) with a minimum of 90 Instructional Days per Semester.

3.2 UGC/AICTE specified Definitions/ Descriptions are adopted appropriately for the various terms and abbreviations used in this PGDP - Academic Regulations/Norms.

3.2.1 Semester Scheme:

Each M.Tech. Degree Programme is of 2 Academic Years (4 Semesters) with each academic year divided into two Semesters of ~ 22 weeks (≥ 90 working days) each, and each semester has - 'Continuous Internal Evaluation (CIE)' and 'End Semester Examination or Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted and suggested by UGC and AICTE are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' or 'COURSE' imply the same meaning here, and refer to 'Theory Subject', or 'Lab/Practical Course', or 'Elective (Program Specific Elective/ Open Elective)', or 'Mini-Project', or 'Seminar', or 'Project', or 'Audit Course' as the case may be.

3.2.2 Credit Courses:

All the 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** (**L**ecture Periods: **T**utorial Periods: **P**racticalsPeriods:**C**redits) Structure, based on the following general pattern:

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L) Courses, and Tutorials (T); and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses.
- Audit Courses shall not carry any Credits.

3.2.3 Subject/ Course Classification:

All Subjects/ Courses offered for the PGDP are broadly classified as:

(a) Core Courses (CoC), and

(b) Elective Courses (E*l*C)

Core Courses (CoC) and Elective Courses (E*l*C) are categorized as PS (Professional Subjects), which are further subdivided as –

(i) PC (Professional/ Departmental Core) Courses

(ii) PSE (Program Specific Elective) Courses

(iii) OE (Open Elective) Courses; and

(iv) Project Works (PW);

Specific prescribed Course by AICTE Model Curriculum (on "Research Methodology & IPR").

Audit Courses (AC - as listed by AITCTE Model Curriculum).

3.2.4 Course Nomenclature:

The Curriculum Nomenclature and Course Structure grouping for GNITS M.Tech. Degree Programmes are as listed below:

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Courses Description*	*Credits*
1)	**Core Courses(CoC)**	**PC - Professional Core**	Includes Core subjects related to the Parent Department/ Branch of Engg.	**18**
2)	**Elective Courses (E*l*C)**	**PSE – Program Specific Elective**	Includes Elective subjects related to the Parent Department/ Branch of Engg.	**15**
		OE - Open Elective	Elective Courses which include subjects from other technical and/or Emerging Areas	**3**
3)	**Project Related Courses**	**PW - Project Work**	M.Tech. Project or PG Project or PG Major Project (Phase-I and Phase-II)	**26**
		Mini-Project (MP)	Mini-Project over 1 semester duration	**2**
		Seminar	Seminar based on core contents related to the Parent Department/ Branch of Engg. in identified specialization	**2**
4)	Prescribed Course	**AICTE Model Curriculum 2018**	Research Methodology & IPR	**2**
5)	Audit Courses	**AC – as per AICTE Model Curriculum 2018**	Inclusive of AICTE Suggested List	**No Credits**
Total Credits for PGDP (For the Specializations Listed)				**68**

4.0 Course Work

4.1 A student, after securing admission, shall pursue and complete the M.Tech. Degree Programme in a minimum period of 2 Academic Years (4 Semesters), and/or within a maximum period of 4 Academic Years (starting from the Date of Commencement of I Year).

4.2 Each student shall register for and secure the specified number of Credits required for the completion of the PG Degree Programme and Award of the M.Tech. Degree in the respective Branch of Engineering with the chosen Specialization.

4.3 The I Year is structured to provide typically 18 Credits in each of the I and II Semesters, and II Year comprises of 16 Credits in each of the I and II semesters,totalling to 68 Credits for the entire M.Tech. Programme.

5.0 Course Registration

5.1 A 'Faculty Advisor' shall be assigned to each M.Tech. Degree Programme student with respective Specialization, and the Faculty Advisor assigned shall advise/counsel the student about the M.Tech. Programme Specialization, its Course Structure and Curriculum, Choice/ Option for Subjects/ Courses, based on the competence, progress, pre-requisites and interest of the student.

5.2 The Academic/Examination Section of the College invites 'Registration Forms' from the students apriori (before the beginning of the Semester) through 'ONLINE SUBMISSIONS' ensuring 'DATE and TIME Stamping'. The ONLINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.3 A student can apply for ONLINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from her assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same being retained with the Head, Faculty Advisor and the Student).

5.4 A student shall Register for Subjects/Courses of 'her CHOICE' with a total of 18 Credits per semester in the I Year as structured in the Programme Curriculum, which will be treated as the Minimum Work Load; she may also seek registration for a maximum of 3 additional/extra credits from those specified for the II Year I Semester (Maximum Work Load thus limited to 21 C) based on her interest, competence, progress, and 'pre-requisites' as indicated for various Subjects/ Courses in the Department Course Structure (for the relevant Specialization) and the Syllabus contents for various Subjects/ Courses, as applicable. All the remaining Credits shall be registered in the II Year-I and II Semesters.

5.5 Thechoice for the 'Additional Subjects/ Courses' in the I Year (in any semester, above the typical 18 Credit norm, and within the Maximum Permissible Limit of 21 Credits, as applicable) must be indicated clearly in the ONLINE Registration, which needs the specific approval and the signature of the Faculty Advisor/Counsellor assigned and the Head of the Department on the hard-copy.

5.6 If the student submits ambiguous choices or multiple options or erroneous entries during ONLINE Registration for the Subject(s)/Course(s) under a given/specified Course Group/Category as listed in the Course Structure for that particular PGDP Specialization, ONLY the first mentioned Subject/ Course in that Category will be taken into consideration, as applicable.

5.7 The Subject/Course Options exercised through ONLINE Registration are final and CANNOT be changed, and CANNOT be inter-changed; further, alternate choices shall also not be considered. However, if the Subject/Course that has already been listed for Registration (by the Head of Department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student may be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements shall be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that semester.

5.8 The Dropping of Subjects/ Courses in any semester of the I Year may be permitted, ONLY AFTER obtaining prior approval and signature from the Faculty Advisor (subject to retaining the minimum of specified 18 Credits) 'within 15 Days of Time' from the beginning of the current semester.

6.0 Class Strength

6.1 The typical student strength for each semester shall be 12 (or as per JNTUH / AICTE Approved Intake).

6.2 A Subject/Course may be offered to the students, ONLY IF a minimum of 50% of the students of a PG Specialization opt for the same.

6.3 In case of the options for Subjects/Courses coming from students of other Departments /Branches/ Disciplines also, PRIORITY shall be given to the student of the 'Parent Department' first.

7.0 Attendance Requirements

7.1 A student shall be eligible to appear for the Semester End Examination (SEE) of any Subject, if she acquires a minimum of 75% of attendance in that Subject for that semester.

7.2 The condoning of shortage of attendance up to 10% in each Subject (for 65% and above, and below 75% attendance cases) of a semester may be granted by the College Academic Committee (CAC) on genuine and valid grounds based on the student's representation with supporting evidence.

7.3 A stipulated fee per Subject/Course shall be payable towards condoning of shortage of attendance.

7.4 The Shortage of Attendance below 65% in any Subject shall in NO case be condoned.

7.5 A student, whose shortage of attendance is not condoned in any Subject(s) in any semester, is considered as 'Detained Student in that Subject(s)', and is not eligible to take End Examination(s) in the Subject(s) detained in that semester; and she has to seek Re-registration for those Subject(s) in subsequent semesters, and attend the same as and when offered.

7.6 Every studentshall put in the minimum required attendance (as specified in Clauses 7.1-7.3) in at least 3 theory subjects and 2 lab courses – (i) in I Year I Semester, for promotion to I Year II Semester, and similarly - (ii) in I Year II Semester along with the Mini-Project, for promotion to II Year I Semester.

7.7 A student shall not be promoted to the next semester unless she satisfies the attendance requirements of the present semester, as applicable. In such cases, she may seek readmission into that semester (and register for all semester subjects), as and when offered. When she fulfils the attendance requirements in the present semester, she shall not be eligible for readmission (or re-register) into the same class/semester again.

8.0 Academic Requirements

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Clause 7.0 …

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if she secures not less than

- 40% marks (24 out of 60 marks)in the Semester End Examination (SEE),
- 40% marks in the Internal Examinations (16 out of 40 marks allotted foe CIE) and
- A minimum of 50% of marks (50 out of 100 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 C Grade or above in that Subject.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to - Mini-Project/ Seminars, if she secures not less than 50% of the total marks allocated. The student would be treated as failed, if she - (i) does not execute the Mini-Project (and submit the report) as specified by the Supervisor, or (ii) does not present the Seminars as required, or (ii)

secures less than 50% of Marks (< 50 marks) in evaluations. She may reappear once for each of the 'Mini-Project/ Seminars' evaluations, as and when they are scheduled again; if she fails in such 'one reappearance' evaluation also, she has to reappear for the same in the next subsequent semester(s), as and when they are scheduled.

8.3 A student shall register for all Subjects covering 68 Credits as specified and listed in the Course Structure for the chosen M.Tech. Degree Specialization, put up all the Attendance and Academic requirements for securing 68 Credits obtaining a minimum of C Grade or above in each Subject, and 'earn all 68 Credits securing SGPA ≥5.0 (in each semester) and final CGPA (i.e., CGPA at the end of PGDP is to be ≥5.0), to successfully complete the PGDP. **THERE IS NO EXEMPTION OF CREDITS IN ANY CASE**

8.4 The Marks and the Letter Grades obtained in all those Subjects covering the specified 68 Credits alone shall be considered for the calculation of final CGPA, which shall be indicated in the Grade Card of the II Year II Semester.

8.5 If a student registers for some more 'extra Subjects' (in the parent Department or other Departments/ Branches of Engg.) other than those listed Subjects totalling 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) shall not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, the Letter Grade alone shall be indicated in the Grade Card as a performance measure, subject to the completion of the Attendance and Academic Requirements as stated in Clauses 7.0 and 8.1 – 8.4 above.

8.6 The students who fail to earn 68 Credits as per the specified Course Structure, and as indicated in Clauses 8.1- 8.5, 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.

8.7 When a student is detained due to the shortage of attendance in any Subject(s) in any semester, no Grade Allotment shall be done for such Subject(s), and SGPA/ CGPA calculations of that semester shall not include the performance evaluations of such Subject(s) in which she gets detained. However, she becomes eligible for re-registration of such Subject(s) (in which she gets detained) in the subsequent semester(s), as and when offered next, with the Academic Regulations of the Batch into which she gets readmitted, by paying the stipulated fees per Subject to the College. In all these re-registration cases, the student shall have to secure a fresh set of Internal Marks (CIE) and Semester End Examination Marks (SEE) for performance evaluation in such Subject(s), and subsequent SGPA/ CGPA calculations.

8.8 A student, eligible to appear for the End Semester Examination (ESE) in any Subject, but is absent at it or failed (failing to secure C Grade or above), may reappear for that Subject at the supplementary examination (Supplementary SEE) as and when conducted. In such cases, her Internal Marks (CIE) assessed earlier for that Subject/ Course will be retained, and added to the marks to be obtained in the supplementary examination (Supplementary SEE) for the evaluation of her performance in that Subject.

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each semester shall be evaluated Subject-wise (irrespective of the Credits assigned) with a maximum of 100 marks for the Theory or Practicals or Mini-Project, or Seminar etc; further, Phase-I and Phase-II of the M.Tech. Project Work (in II Year I and II semesters) shall also be evaluated for 100 marks each. These evaluations shall be based on 40% CIE and 60% SEE, and a Letter Grade corresponding to the % of marks obtained shall be given.

9.2 For all the Subjects/ Courses as mentioned in 9.1**,** the distribution shall be: 40 marks for CIE (Continuous Internal Evaluation), and 60 marks for the SEE (Semester End Examination).

9.3 **a)** In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid-Term Examination for 30 marks:
   a. Part - A: Objective/quiz paper for 10 marks.
   b. Part – B: Descriptive paper for 20 marks.

   The objective/quiz paper is set with 10 questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 30 marks). The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:
2. Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 40% of marks (i.e. 16 marks out of 40 marks) in CIE, 40% of marks (i.e. 24 marks out of 60) in SEE and Overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks taking together.
- *The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.*
- *In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.*

b) 60 marks are allocated for Semester End Examination (SEE), which is of 3 hours duration. The SEE Question Paper will have two parts: Part-A is for 10 marks and is compulsory - it consists of 10 questions of 1 mark each (2 questions from each unit) and Part-B is for 50 marks – it consists of 5 questions of 10 marks each, for each question there will be 'either/ or' choice, which means that there will be two questions from each unit and the student should answer one of these two.

9.4 For the Lab./Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks, and Semester End Examination (SEE) at the end of the semester for 60

marks. Out of the 40 marks for Internals, day-to-day work assessment in the laboratory shall be evaluated for 20 marks; the performance in an Internal Lab./Practical Test (10 marks) and viva-voce (10 marks) shall be evaluated for a total of 20 marks. The Semester End Examination (SEE) for Lab./ Practicals shall be conducted at the end of the semester by the Lab. Teacher concerned and another faculty member of the same Department as assigned by the Head of the Department.

The Student, in each subject, shall have to earn 40% of marks (i.e. 16 marks out of 40 marks) in CIE, 40% of marks (i.e. 24 marks out of 60) in SEE and Overall 50% of marks (i.e. 50 marks out of 100 marks) both CIE and SEE marks taking together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥40% (16 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 40% of CIE marks (16 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE

9.5 **a)** There shall be a Mini-Project, preferably in collaboration with an Industry with the relevant specialization to be registered and executed during the I Year II Semester, for about sixteen weeks duration. It shall also carry 100 marks, out of which CIE shall be for 40 marks, and SEE shall be for 60 marks. Marks earned under CIE for the 'Mini-Project' shall be awarded by the Mini-Project Guide/Supervisor (based on the continuous evaluation of student's performance during the Mini-Project execution period).

b) The Mini-Project work shall be submitted in a Technical Report form, and a presentation of the same shall be made before a Committee, and the 'Mini-Project' shall be evaluated by the Committee for 60 Marks (SEE).The Committee shall consist of the Head of the Department, the Supervisor of Mini-Project, and a Senior Faculty Member of the Department. Performance evaluation of the 'Mini-Project' shall be included in the I Year II Semester Grade Card.

9.6 **Electives:** 5 Program Specific Elective (PSE) Courses and 1 Open Elective (OE) Course are offered in the 4 Semester PG Degree Programme at GNITS, as per AICTE Model Curriculum. Students are to choose each Elective Course from the corresponding Set of Electives given, and the evaluation of the Elective Course shall be the same as that for the Theory Course/Subject.

9.7 There shall be Seminar Presentations in the I Year, I and II Semesters. For the Seminar, the student shall collect the information on a technical topic, prepare a Technical Report and submit the Technical Report to the Department at the time of Seminar Presentation. Each Seminar Presentation (along with the Technical Report submitted) shall be evaluated for 100 marks by Two Faculty Members assigned by the Head of the Department. There shall be no SEE or external examination for the Seminar.

9.8 Every student shall be required to execute her M.Tech. Project under the guidance of the Supervisor assigned to her by the Head of the Department, and shall submit her dissertation on a topic relevant to her PG specialization.

a) The M.Tech. Project shall start immediately after the completion of the I Year II Semester, and shall be divided and carried out in 2 phases: Phase–I during II Year I Semester, and Phase–II during II Year II Semester. The student shall prepare and submit two independent Project Work Reports - Project Work Report-I shall include the Project Work carried out under Phase–I, and the Project Work Report-II (Final Report) shall include the Project Work carried out under Phase–I and Phase–II put together.

b) In Phase-I of the Project Work,the student shall carry out the literature survey, select an appropriate topic and submit a Project Proposal within 6 weeks (immediately after her I Year II Semester End Examinations), for approval by the Project Review Committee (PRC). The PRC shall be constituted by the Head of the Department, and shall consist of the Head of the Department, Project Supervisor, and a Senior Faculty Member of the Department. The student shall present her Project Work Proposal to the PRC (PRC-I Presentation), on whose approval she can 'REGISTER for the M.Tech Project'. Every student shall compulsorily register for her M.Tech. Project Work, preferably within the 6 weeks of time frame as specified.

c) After the Registration, the student shall carry out the work, and periodically submit 'a periodic progress report' to her Supervisor throughout the Project period. The PRC shall monitor the progress of the Project Work and review, based on the PRC-II and PRC-III presentations and performance evaluations – the first one at the middle of the II Year I Semester, and the second one at the end of the II Year I Semester (before the I Semester End Examinations). The student shall also submit the Project Work Report-I to the PRC at PRC-III, for the PRC considerations and evaluations.

d) 100 marks are allocated for each Phase (Phase-I and Phase-II) of the Project Work, out of which 40 marks shall be for CIE (Continuous Internal Evaluation/CIE), and 60 Marks will be for SEE (Semester End viva-voce Examination).

e) The marks earned under CIE for the Phase-I of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance, all her PRC presentations during the Project Work Phase-I period and Project Work Report-I). For SEE marks of Project Phase-I, the Project Work Report-I shall be examined, and viva-voce shall be conducted at the end of the II Year I Semester (along with PRC-III) by the PRC, and the corresponding SEE marks shall be awarded.

f) The Phase-II of the Project shall be carried out in the II Year II Semester, and the student's progress and performance evaluation shall be carried out through PRC-IV (at the middle of the semester), and PRC-V (at the end of the II semester) presentations. The student shall submit the Project Work Report-II (Final Project Report or Dissertation Draft Copy) to the PRC at PRC-V, for the PRC-V considerations and evaluations. Marks earned under CIE for Phase-II of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance, all her PRC presentations during the Project Work Phase-II period and Project Work Report-II). Marks earned under SEE for Phase-II Work shall be awarded by the External Examiner, after the evaluation of the M.Tech. dissertation and the final viva-voce examination of the M.Tech. Project Work.

g) After the PRC-V presentation, the PRC shall evaluate the entire performance of the student and declare the Project Work as 'Satisfactory' or 'Unsatisfactory'. Every Final Project Work Report (that has been declared 'satisfactory') shall undergo 'Plagiarism Check' as per the University/ College norms to ensure the plagiarism content to be below the specified level of 30%, to be acceptable for submission. In case of the unacceptable plagiarism levels, the student shall resubmit the Modified Project Work Report/Dissertation, after carrying out the necessary modifications/ additions to her Project Work/Report as suggested by the PRC, within the specified time.

h) If any student could not be present for any PRC at the scheduled time (after approval and registration of her Project Work at the PRC-I), or her progress is considered as 'not satisfactory' at any scheduled PRC, she will have to reappear (within one month period) for the same PRC presentation and evaluation at a later date/time as suggested by the PRC.

i) A student is allowed to submit her M.Tech. Project Dissertation 'only after the completion of 40 weeks from the date of approval/registration' of her Project, and after obtaining all the approvals from the PRC. The extension of time, within the total permissible limits of completion of the PGDC may be considered by the PRC on sufficient valid, genuine grounds.

j) The student shall be allowed to submit her M.Tech. Project Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Labs.), Mini-Project, Seminars etc. (securing C Grade or above), and after obtaining all approvals from PRC. In such cases, the M.Tech. Dissertation will be sent to an External Examiner nominated by the Principal of the College, from the panel of 3 names of external faculty members (Professors or Associate Professors, outside the college) suggested by the Head of Department, on whose approval, the student can appear for the M.Tech. Project viva-voce Examination, which shall be conducted by a Board, consisting of the PG Project Supervisor, Head of the Department, and the External Examiner who adjudicated the M.Tech. Project Work and Dissertation. The Board shall jointly declare the Project Work Performance as 'satisfactory', or 'unsatisfactory'; and in successful cases, the External Examiner shall evaluate the Student's Project Work presentation and performance for 60 Marks (SEE).

k) If the adjudication report of the External Examiner is 'not favourable', then the student shall revise and resubmit her M.Tech Dissertation after one semester, or as per the time specified by the External Examiner and/ or the PRC. If the resubmitted report is again evaluated by the External Examiner as 'not favourable', then that Dissertation will be summarily rejected. Subsequent actions for such rejected dissertations may be considered, only on the specific recommendations of the External Examiner and/ or PRC.

l) In cases, where the Board declared the Project Work Performance as 'unsatisfactory', the student is deemed to have failed in the Project viva-voce Examination, and she may reappear for the viva-voce Examination as per the Board's recommendations. If she fails in the second viva-voce Examination also, she shall not be considered eligible for the Award of the Degree, unless she is asked to revise and resubmit her Project Work by the Board within a specified time period (with in 4 years from the date of commencement of her I Year I Semester).

10.0 Re-Admission / Re-Registration

10.1 Re-Admission for Discontinued Students:

The student who has discontinued the M.Tech. Degree Programme on account of 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 she get readmitted, with prior permission from the authorities concerned, subject to Clause 4.1.

10.2 Re-Registration for Detained Students:

When any student is detained in a Subject(s) on account of the shortage of attendance in any semester, she may be permitted to re-register for the same Subject(s) in the 'same category' (Core or Elective Group) or equivalent Subject(s) if the same Subject is not available, as suggested by the BoS Chair of that Department, as and when offered in the sub-sequent semester(s), with the Academic Regulations of the Batch into which she seeks re-registration, with prior permission from the authorities concerned, subject to Clause 4.1.

11.0 Grading Procedure

11.1 The marks shall be awarded to indicate the performance of each student in each Theory Subject, or

Lab/Practicals, or Mini-Project, or Seminar, or Project etc., and based on the % of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Clause 9.0, a corresponding Letter Grade shall be given.

11.2 A Letter Grade does not imply any specific % of marks.

11.3 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 (UGC Guidelines)*	*Grade Points (GP)*
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80%, < 90%)	A^+(Excellent)	9
Below 80% but not less than 70% (≥ 70%, < 80%)	A(Very Good)	8
Below 70% but not less than 60% (≥ 60%, <70%)	B^+(Good)	7
Below 60% but not less than 55% (≥ 55%, < 60%)	B(above Average)	6
Below 55% but not less than 50% (≥ 50%, < 55%)	C(Average)	5
Below 50% (< 50%)	F(FAIL)	0

11.4 A student obtaining F Grade in any Subject shall be considered 'failed'. If a student fails to appear for SEE of any Subject (s) for any reason whatsoever, she is deemed to have 'failed', and she will get F Grade in all such failed Subject (s). She will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), in the subsequent semesters, as and when offered. In such cases, her Internal marks (CIE marks) in those Subject(s) will remain same as those she obtained earlier.

11.5 In general, a student shall not be permitted to repeat any Subject(s) with the sole intention of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, she has to repeat all those Subject(s), in which she got 'detained due to lack of required attendance' (as listed in Clauses 8.7 and 10.2), through Re-Registration at a later date.

11.6 A student earns Grade Points (GP) in each Subject on the basis of the Letter Grade obtained by her in that Subject. Then, the corresponding 'Credit Points' (CP) are computed by multiplying theGrade Points with Credits for that particular Subject/Seminar/Comprehensive Viva-voce/Project.

Credit Points (CP) = Grade Points (GP) x Credits

11.7 The student passes the Subject/ Seminar/ Comprehensive Viva-voce/Project only when she gets GP ≥ 5 (C Grade or above).

11.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (SCP) secured from ALL the Subjects/ Seminar/ Comprehensive Viva-voce/Project 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

$$\textbf{SGPA} = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \quad \textbf{.... For each semester},$$

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester, C_i is the no. of Credits allotted to the i^{th} Subject,

and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

11.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over 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 Second Semester onwards, at the end of each Semester, as per the formula

$$\textbf{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \quad \textbf{.... For all S Semesters registered}$$

(ie., upto and inclusive of S semesters, S ≥ 2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of that PGDC Specialization) the student has 'REGISTERED' from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_i is the no. of Credits allotted to the j^{th} Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j^{th} Subject. After Registration and completion of the I Year I Semester however, the SGPA of that Semester itself may be taken as CGPA, as there are no cumulative effects.

11.10 For the Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

11.11 For the calculations listed in Clauses 11.6 – 11.10, performance in the failed Subjects/ Courses (securing F Grade) shall also be taken into account, and the Credits of such Subjects/Courses shall also be included in the multiplications and summations.

11.12 Passing Standards:

a) A Student shall be declared successful or 'passed' in a semester, only when she gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire PGDP, only when she gets a CGPA ≥ 5.00; subject to the condition that she secures a GP ≥ 5 (C Grade or above) in every registered Subject/ Course in each semester (during the entire PGDP), for the Award of the Degree, as required.

b) After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the Letter Grades and the Credits earned. The Grade Card/Grade Sheet shall show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned), Credits earned, SGPA, and CGPA etc.

12.0 Declaration of Results

12.1 The Computation of SGPA and CGPA are done using the procedure listed in Clauses 11.6 – 11.11.

12.2 For the Final % of Marks equivalent to the computed CGPA, the following formula may be used

% of Marks = (final CGPA - 0.5) x 10

13.0 Award of Degree

13.1 A student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire M.Tech. Programme (PGDP), and secures the required number of 68 Credits (with CGPA ≥ 5.0), within the 4 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the M.Tech. Degree in the chosen Branch of Engineering, with the Specialization considered at the time of Admission.

13.2 A student who qualifies for the Award of the M.Tech. Degree (in her chosen Branch/ Specialization) as listed in Clause 13.1, shall be placed in the following Class Divisions:

AWARD OF CLASS BASED ON FINAL CGPA (at the end of the PG Programme)

First Class with Distinction	Final CGPA 8.00 or more*
First Class	Final CGPA below 8.00 but not less than 7.00
Second Class	Final CGPA below 7.00 but not less than 6.00
Pass Class	Final CGPA below 6.00 but not less than 5.00

*** Note :**

a) A student with Final CGPA (at the end of the PG Degree Programme) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Subjects/ Courses within the first 2 Academic Years (or 4 Sequential Semesters) from the Date of Commencement of her First Academic Year,

(ii) should not have been detained or prevented from writing the End Semester Examinations in any semester due to shortage of attendance or any other reason, shall be placed in 'FIRST CLASS with DISTINCTION'.

A student fulfilling the conditions listed under (a) above, alone will be the eligible candidate for the 'University/College Rank' and/or 'Gold Medal' considerations.

b) A student with Final CGPA (at the end of PG Degree Programme) ≥ 8.00, but not fulfilling the above conditions, shall be placed in 'FIRST CLASS'.

13.3 A student with Final CGPA (at the end of the PG Degree Programme) < 5.00 will not be eligible for the Award of the Degree.

14.0 Withholding of Results

14.1 If a student has not paid fees to the University/College at any stage, or has pending dues against her name on account of any reason whatsoever, or if any case of indiscipline is pending against her, the result of such student may be withheld, and she shall not be allowed to into the next higher semester. The Award or issue of the Degree may also be withheld in such cases.

15.0 Transitory Regulations

15.1 A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed in her M.Tech. Degree Programme after the PGDP period of 2 years, may be considered eligible for readmission - to the same PGDP with same set of Subjects/ Courses (or equivalent Subjects/ Courses as the case may be), and/or to the same Program Specific 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 her I Year I Semester), along with the Academic Regulations of the Batch into which she gets readmitted.

16.0 Student Transfers

16.1 There shall be no Branch/ Specialization transfers after the completion of the Admission Process.

17.0 Scope

i) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

ii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

iv) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College Authorities.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices / Improper conduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student 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 students 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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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.
3.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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 , 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 student 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 student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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 chiefsuperintendent/assistant –superintendent / any officer on duty or misbehaves or creates disturbance of anykind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, eitherspoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendencyto disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students 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 student 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 student is also debarred for

		two consecutive semesters from class work and all university examinations. The continuation of the course by the student 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 student has alreadyappeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student 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 student 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 student 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 andcancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations andproject 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 student 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 university for further action to award suitable punishment.	

M. Tech. 2 Year (4 Semesters) Regular Programme in
COMPUTER NETWORKS AND INFORMATION SECURITY (CNIS)
Department of Information Technology
COURSE STRUCTURE

I YEAR **I SEMESTER**

S.No	Group	Sub Code	Subject	L	T	P	Credits
1)	PC	521DA	Advanced Data Structures	3	0	0	3
2)	PC	521DB	Mathematical Foundations of Cryptography	3	0	0	3
3)	PSE1	**Program Specific Elective – 1**		3	0	0	3
		521DC	TCP/IP Internetworking				
		521DD	Wireless Networks and Mobile Computing				
		521DE	Distributed Systems				
4)	PSE2	**Program Specific Elective – 2**		3	0	0	3
		521DF	Information Security				
		521DG	Malware Analysis				
		521DH	Ethical Hacking				
5)	PC	52150	Advanced Data Structures Lab	0	0	3	1.5
6)	PC	**Lab (Linked to PSE2)**		0	0	3	1.5
		52151	Information Security Lab				
		52152	Malware Analysis Lab				
		52153	Ethical Hacking Lab				
7)	PW	521DJ	Research Methodology and IPR	2	0	0	2
8)	PW	52154	Seminar – 1	0	0	2	1
9)	AC1	Audit Course – 1		2	0	0	-
TOTAL CREDITS							**18**

I YEAR **II SEMESTER**

S.No	Group	Sub Code	Subject	L	T	P	Credits
1)	PC	522DK	Advanced Algorithms	3	0	0	3
2)	PC	522DL	Soft Computing	3	0	0	3
3)	PSE3	**Program Specific Elective - 3**		3	0	0	3
		522DM	Secure Software Engineering				
		522DN	Digital Forensics				
		522DP	Cloud Security				
4)	PSE4	**Program Specific Elective - 4**		3	0	0	3
		522DQ	Internet of Things and Security				
		522DR	Web and Database Security				
		522DS	Cyber Security				
5)	PC	52256	Advanced Algorithms Lab	0	0	3	1.5
6)	PC	**Lab (Linked to PSE4)**		0	0	3	1.5
		52257	Internet of Things and Security Lab				
		52258	Web and Database Security Lab				
		52259	Cyber Security Lab				
7)	PW	52260	Mini Project	0	0	4	2
8)	PW	52261	Seminar–2	0	0	2	1
9)	AC2	Audit Course – 2		2	0	0	-
TOTAL CREDITS							**18**

M. Tech. 2 Year (4 Semesters) Regular Programme in
COMPUTER NETWORKS AND INFORMATION SECURITY (CNIS)
Department of Information Technology
COURSE STRUCTURE

II YEAR **I SEMESTER**

S.No	Group	Sub Code	Subject	L	T	P	Credits
1)	PSE5	**Program Specific Elective –5**		3	0	0	3
		523DT	Blockchain Technology				
		523DU	Intrusion Detection and Prevention Systems				
		523DV	Ethics and Laws of Cyber Security				
2)	OE	Open Elective		3	0	0	3
3)	PW	52363	Project/ Dissertation (Phase – I)	0	0	20	10
TOTAL CREDITS							**16**

II YEAR **II SEMESTER**

S.No	Group	Sub Code	Subject	L	T	P	Credits
1)	PW	52464	Project/ Dissertation (Phase–II)	0	0	32	16
TOTAL CREDITS							**16**

AUDIT COURSES

1) English for Research Paper Writing-521HA/522HA
2) Disaster Management-521HB/522HB
3) SANSKRIT for Technical Knowledge-521HC/522HC
4) Value Education-521HD/522HD
5) Constitution of India-521HE/522HE
6) Pedagogy Studies-521HF/522HF
7) Stress Management by YOGA-521HG/522HG
8) Personality Development through Life Enlightenment Skills-521HH/522HH

OPEN ELECTIVES :

1) Business Analytics—523GA
2) Industrial Safety—523GB
3) Operations Research—523GC
4) Cost Management of Engineering Projects—523GD
5) Composite Materials—523GE
6) Energy from Waste—523GF
7) Power from Renewable Energy Sources. —523GG

I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:521DA **3 0 0 3**

ADVANCED DATA STRUCTURES

(Common to CNIS & CSE)

Prerequisites:-Nil-

Course Objectives:

1. Able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2. Able to understand the necessary mathematical abstraction to solve problems.
3. Familiarize with advanced paradigms and data structure used to solve algorithmic problems.

UNIT 1: (~ 8 Lecture Hours**)**

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. Recent trends in hashing.

UNIT 2: (~ 8 Lecture Hours**)**

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 3: (~ 12 Lecture Hours**)**

Trees: Binary Search Trees: Definition, Properties & Operations, AVL Trees: Definition & Operations, Red Black Trees: Properties & Operations, B-Trees: Definition & Operations,2-3 Trees: Definition & Operations, Splay Trees: Definition & Operations.

UNIT 4: (~ 9 Lecture Hours**)**

Text Processing: String 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 5: (~ 8 Lecture Hours**)**

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.

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in JAVA, 3rd Edition, Pearson, 2012.
2. M T Goodrich and Roberto Tamassia, Algorithm Design, John Wiley, 2006.

Reference Books:

1. A.Drozdek, Data Structures and Algorithms in java, 3rd Edition, Cengage Learning, 2008.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2006.
3. Sartaj Sahni, Data structures, Algorithms and Applications in Java, 2nd Edition, Universities Press, 2005.

Online Resources:

1. https://www.cise.ufl.edu/~sahni/cop3530/presentations.htm
2. https://www.cdn.geeksforgeeks.org/advanced-data-structures/
3. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
4. https://www.coursera.org/

Course Outcomes:

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

1. Demonstrate various hashing techniques.
2. Analyze and construct Skip Lists.
3. Construct and analyze operations of red-black trees, B-trees and Splay trees.
4. Develop algorithms for text processing applications.
5. Predict suitable data structures and implement algorithms for computational geometry problems.

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I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:521DB **3 0 0 3**

MATHEMATICAL FOUNDATIONS OF CRYPTOGRAPHY

Prerequisites:-Nil-

Course Objectives:

1. The basics of mathematical models used in information security.
2. The general understanding of cyber security relationship with numbers.
3. The role of mathematics in a complex system such as the Internet.
4. Understanding the mathematics behind cryptography and how to use the theorems for research purposes.

UNIT 1: (~9 Lecture Hours**)**

ALGEBRAIC STRUCTURE: Algebraic Structures: Groups – Cyclic groups, Cosets, Modulo groups - Primitive roots - Discrete logarithms. Rings – Sub rings, ideals and quotient rings, Integral domains. Fields – Finite fields – $GF(p^n)$, $GF(2^n)$ - Classification - Structure of finite fields. Lattice, Lattice as Algebraic system, sub lattices.

UNIT 2: (~9 Lecture Hours**)**

INTRODUCTION TO NUMBER THEORY: Definition - Divisibility - Greatest common divisor - Prime numbers - Fundamental theorem of arithmetic - Mersenne primes - Fermat numbers - Euclidean algorithm - Fermats theorem - Euler totient function - Eulers theorem. Congruences: Definition - Basic properties of congruences - Residue classes - Chinese remainder theorem.

UNIT 3: (~10 Lecture Hours**)**

Classical Cryptography: Introduction, Simple Cryptosystems- Shift Cipher, Substitution Cipher, AffineCipher, VigenereCipher, HillCipher, Permutation Cipher, Stream Ciphers, Playfair Cipher.

UNIT 4: (~9 Lecture Hours**)**

Fundamental constructs – One-Way Functions, Pseudo-random number generator, Signcryption, ID-based and certificateless cryptology, Zero knowledge protocols - perfect, statistical, and computational zero knowledge.

UNIT 5: (~8 Lecture Hours**)**

Basic elliptic curve cryptography: Definition, Properties of Elliptic Curves, Mathematical formulation- Elliptic Curves over the Reals, Elliptic Curves over Finite Fields, Elliptic Curves Modulo a Prime, Pairings.

Text Books:

1. Stein William. "Elementary number theory. Primes, congruence's, and secrets." A computational approach.
2. Neal Koblitz "A course in Number Theory and Cryptography" Springer-Verlag 1994.

Reference Books:

1. William Stallings "Cryptography and Network Security" Fifth Edition, Prentice Hall, 2011.
2. Alfred J Menzes, Paul C Van Oorshot and Scott A. Vanstone "Handbook of Applied Cryptography", CBC Press, 1996.
3. ChristofPaar, "Understanding Cryptography", Springer-Verlag-2010.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma42/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs03/preview
3. https://www.coursera.org/learn/mathematical-foundations-cryptography
4. https://www.udemy.com/course/number-theory-and-cryptography/

Course Outcomes:

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

1. Illustrate the basic mathematical principles and functions that form the foundation for cryptographic and cryptanalysis methods.
2. Understand the number-theoretic foundationsof modern cryptography and theprinciples behind their security.
3. Discriminate fundamental number-theoretic algorithms such as the Euclidean algorithm, the Chinese Remainder algorithm, binary powering, and algorithms for integer arithmetic.
4. Analyse various security models for Encryption schemes, implement and analyse how elliptic curves are used in certain cryptographic algorithms.
5. Demonstrate strong pseudorandom generators for hashing, private-public key cryptosystemsand the relevance of Zero knowledge protocol to cryptographic techniques.

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I Year M.Tech. CNIS I Sem **L T P C**
Couse Code:521DC **3 0 0 3**

TCP/IP INTERNETWORKING

(Program Specific Elective-1)

Prerequisites: -Nil-

Course Objectives:

1. To explain the major functions of networks with TCP/IP model.
2. To explain the protocols of Network Layer.
3. To understand the transport layer protocols of TCP/IP model.
4. To understand client server mechanisms with the protocols such as DNS & Telnet.
5. To understand transfer of data and management of networks using application layer protocols.

UNIT 1: (~9 Lecture Hours**)**

Introduction to TCP/IP, The OSI Model and TCP/IP Protocol Suites, Underlying Technologies; IP Addressing, Sub netting and Super netting, CIDR, Delivery and Routing of IP Packets.

UNIT 2: (~8 Lecture Hours**)**

Internet Protocol (IP), ARP and RARP, Internet Control Message Protocol (ICMP), Internet Group Management Protocol (IGMP).

UNIT 3: (~10 Lecture Hours**)**

User Datagram Protocol (UDP), Transmission Control Protocol (TCP); Routing Protocols (RIP, OSPF, HELLO and BGP).

UNIT 4: (~6 Lecture Hours**)**

Application Layer and Client-Server Model, BOOTP and DHCP; Domain Name System (DNS), Telnet and Rlogin.

UNIT 5: (~12 Lecture Hours**)**

File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP) Simple Mail Transfer Protocol (SMTP), Simple Network Management Protocol (SNMP), Hyper Text Transfer Protocol (HTTP).

Text Books:

1. Douglas E. Comer, "Internetworking with TCP/IP, Principles, Protocols and Architectures", Vol.I, Fourth Edition, PHI.
2. ForouzanBA, "TCP/IP Protocol Suite", TMH (2000).

Reference Books:

1. TCP/IP Unleashed, Pearson Education.
2. Richard Stevens, TCP/IP Illustrated, Vol. 1. Addison Wesley Publisher.
3. Charles M. Kozierok, The TCP/IP Guide: A Comprehensive, Illustrated Internet ProtocolsReference 1st Edition.

Online Resources:

1. https://mikrotik.com/documentation/TCP-IP_Resources_List.htm
2. http://cpe.rmutt.ac.th/network/images/cn/[3]Comer_Douglas_Internetworking_with_TCP_IP_Vol.1.pdf
3. http://clweb.csa.iisc.ernet.in/kdinesh/Comer-TCPIP.pdf
4. http://www.it.iut.ac.ir/sites/fsites/it/files/u4/uploads/Chapter04-5th_2011.pdf
5. https://www.coursera.org

Course Outcomes:

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

1. Differentiate between OSI and TCP/IP reference models and IP V4 addressing.
2. Explain about header formats of various Internet Layer protocols and usage of these protocols.
3. Summarize header formats of various Transport Layer protocols and usage of these protocols.
4. Interpret various application layer protocols.
5. Demonstrate and use the application layer protocols for developing real-time Applications.

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I Year M.Tech. CNIS - I Sem **L T P C**
Couse Code:521DD **3 0 0 3**

WIRELESS NETWORKS AND MOBILE COMPUTING

(Program Specific Elective-1)

Prerequisites: -Nil-

Course Objectives:

1. Introduce an advanced element of learning in the field of wireless communication.
2. Expose the students to the fundamental concepts of wireless devices and mobile computing.
3. Provide a computer systems perspective on the emerging areas of wireless networking and its software.

UNIT 1: (~10 Lecture Hours**)**

Introduction- Evolution of wireless technology (generations), Cellular System.

WLAN- Infrared vs. Radio Transmission, Infrastructure and Ad Hoc Networks, IEEE 802.11-System Architecture, Protocol Architecture.

Mobile Computing (MC): Introduction to MC, Novel Applications, Limitations, and Architecture.

GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, New Data Services -HSCSD, GPRS.

UNIT 2: (~ 7 Lecture Hours**)**

(Wireless) Medium Access Control: Motivation for a Specialized MAC- Hidden and Exposed Terminals, Near and Far Terminals, SDMA, FDMA, TDMA, CDMA. Collision Avoidance protocols: MACA, MACAW.

UNIT 3: (~10 Lecture Hours**)**

Mobile Network Layer: Goals, Assumptions and requirements, Entities and terminology, IP Packet Delivery, Agent discovery, Registration, Tunnelling and Encapsulation, Optimizations, DHCP.

Mobile Transport Layer: Traditional TCP, Classical TCP Improvements- Indirect TCP,Snooping TCP, Mobile TCP, Fast Retransmit/Recovery, Transmission/Timeout freezing, Selective retransmission, Transaction oriented TCP.

UNIT 4: (~9 Lecture Hours**)**

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QOS Issues.

Data Dissemination: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Methods, Digital Audio and Video Broadcasting.

UNIT 5: (~9 Lecture Hours**)**

Mobile Adhoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV.

Protocols and Platforms for Mobile Computing: WAP, Bluetooth, Palm OS, Windows CE, Symbian OS, Linux for Mobile devices, J2ME, XML.

Text Books:

1. Jochen Schiller, Mobile Communications, Addison- 2nd Edition, Wesley, 2004.
2. Raj Kamal, Mobile Computing, Oxford University Press, 2007, ISBN: 0195686772.

Reference Books:

1. Stojmenovic and Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley, 2002, ISBN 0471419028.
2. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press, ISBN: 0521817331, Oct 2004.
3. Asoke K Talukder, Roopa R Yavagal "Mobile Computing Technology, Applications and Service Creation" Tata McGraw Hill, Second Edition ISBN-10: 0070707316; ISBN-13: 978-0070707313, 2005.

Online Resources:

1. https://www.minigranth.com/mobile-computing/
2. https://nptel.ac.in/courses/117102062/
3. https://www.tutorialspoint.com/wireless_communication/
4. https://inet.omnetpp.org/docs/showcases/routing/manet/doc/index.html.
5. https://www.coursera.org/learn/wireless-communications.
6. https://www.ed.youth4work.com/course/479-mobile-computing- online-course.

Course Outcomes:

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

1. Understand the basic components and principles of mobile computing architecture.
2. Demonstrate the knowledge of WLANs and cellular communication standards.
3. Distinguish various platforms and protocols used in mobile environment.
4. Interpret the database issues and data dissemination models.
5. Apply the knowledge of MANETs and their routing protocols to solve real world problems.

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I Year M.Tech. CNIS - I Sem **L T P C**
Couse Code:521DE **3 0 0 3**

DISTRIBUTED SYSTEMS

(Program Specific Elective-1)
(Common to CNIS & CSE)

Prerequisites: -Nil-

Course Objectives:

1. Identify what and why a distributed system is.
2. Understand theoretical concepts, namely, virtual time, agreement and consensus protocols.
3. Understand IPC, Group Communication & RPC Concepts.
4. Understand DFS and DSM concepts.
5. Understand the concepts of transaction in distributed environment and associated concepts namely, concurrency control, deadlocks and error recovery.

UNIT 1: (~8 Lecture Hours**)**

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

System models - Introduction, Architectural models, Fundamental models.

UNIT 2: (~10 Lecture Hours**)**

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 3: (~10 Lecture Hours**)**

Inter Process Communication - Introduction, The API for the Internet Protocols, External data representation and marshalling, Client-Server communication, Group communication, Case Study: IPC in UNIX.

Distributed objects and Remote Invocation - Introduction, Communication between distributed objects, Remote Procedure Call, Events and notifications, Case study: Java RMI.

UNIT 4: (~10 Lecture Hours**)**

Distributed File Systems - Introduction, File Service architecture, Case study 1: SUN network file system, Case study 2: The Andrew file system.

Distributed Shared Memory - Introduction, Design and Implementation issues, Sequential Consistency and IVY case study, Release Consistency,Munin Case Study, Other Consistency Models, Google case study.

UNIT 5: (~8 Lecture Hours**)**

Name Services - Introduction, Name Services and the Domain Name System, Directory Services, Case study of the Global Name Services.

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

Text Books:

1. George Coulouris, J Dollimore and Tim Kindberg, Distributed Systems, Concepts and Design, Pearson Education, 4_{th} Edition, 2009.

Reference Books:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed systems, Principles and Paradigms, 2nd Edition, PHI, 2006.
2. Sukumar Ghosh, Distributed Systems- An Algorithm Approach, Chapman and Hall/CRC, Taylor and Fransis Group, 2007.

Online Resources:

1. https://www.smartzworld.com/notes/distributed-systems-notes-pdfds
2. http://nptel.ac.in/courses/106106107
3. https://edutainmentzone.blogspot.com › Home › DS › Education

Course Outcomes:

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

1. Understand the concepts of distributed system, various system models.
2. Apply virtual time, agreement and consensus protocols in distributed systems.
3. Analyse the establishment of Inter process communication between distributed systems.
4. Comprehend and design a new distributed system with the features that support distributed file system and distributed shared memory.
5. Apply and analyse the knowledge of distributed transactions.
6. Develop new distributed applications.

I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:521DF **3 0 0 3**

INFORMATION SECURITY

(Program Specific Elective-2)

Prerequisites: -Nil-

Course Objectives:

1. Understand basics of Cryptography and Network Security.
2. Secure a message over insecure channel by various means.
3. Acquire knowledge on cryptographic algorithms and key management techniques.
4. Understand various Wireless Network Security concepts.

UNIT 1: (~9 Lecture Hours**)**

Computer and Network Security Concepts: Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Models, Steganography.

Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, DES, Strength of DES.

UNIT 2: (~9 Lecture Hours**)**

Advanced Encryption Standard: AES structure, AES Transformation Functions, AES Key expansion.

Computer-based Symmetric Key Cryptographic Algorithms: International Data Encryption Algorithm (IDEA), RC4.

Block Cipher Operations: Multiple Encryption and Triple DES, Electronic Codebook, Cipher Block Chaining Mode, Cipher Feedback Mode.

Asymmetric Ciphers: RSA Algorithm, Diffie-Hellman Key exchange.

UNIT 3: (~9 Lecture Hours**)**

Cryptographic Data Integrity Algorithms: Cryptographic Hash functions: Applications of Cryptographic Hash functions, Two simple Hash functions, Requirements and Security, SHA.

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, HMAC, CMAC.

Digital Signatures: Digital Signatures, Elgammal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys.

UNIT 4: (~11 Lecture Hours**)**

X.509 Certificates, Kerberos.

Transport-Level Security: Web Security, Transport Layer Security, HTTPS.

Electronic Mail Security: S/MIME, Pretty Good Privacy.

UNIT 5: (~7 Lecture Hours**)**

IP Security: IP Security overview, IP Security Policy, Encapsulating security payload, combining security associations, Internet Key Exchange.

Case Studies on Cryptography and Security: Secure Multiparty Calculation, Virtual Elections, Single Sign On, Secure Inter-Branch Payment Transactions, Cross Site Scripting Vulnerability.

Text Books:

1. William Stallings, 7_{th} Edition, Cryptography and Network Security.
2. AtulKahate, Cryptography and Network Security, 3rd Edition, McGraw Hill.

Reference Books:

1. William Stallings, Network Security Essentials (Applications and Standards), 4th Edition, Pearson Education.
2. C K Shyamala, N Harini and Dr T Padmanabhan, Cryptography and Network Security, 1st Edition, Wiley India.

Online Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/ network_security.htm.
2. http://scitechconnect.elsevier.com/wp-content/uploads/2013/09/Network-Security-Basics.pdf.
3. https://alison.com/course/introduction-to-computer-network-security.
4. https://online.stanford.edu/course/network-security.
5. https://www.coursera.org/browse/computer-science/computer-security-and-networks?languages=en

Course Outcomes:

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

1. Analyse and design classical Encryption techniques, Block ciphers, and Stream ciphers.
2. Understand Conventional Encryptions like DES, AES etc.,
3. Evaluate public-key cryptosystems such as RSA, Diffie-Hellman Key Exchange, ElGammal Cryptosystem, etc.,
4. Design Hash, MAC algorithms, Digital Signatures and understand key management distribution schemes.
5. Examine the need for network and web security in real time applications.

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I Year M.Tech. CNIS - I Sem **L T P C**
Couse Code:521DG **3 0 0 3**

MALWARE ANALYSIS

(Program Specific Elective-2)

Prerequisites: Computer Programming.

Course Objectives:

1. Able to understand and analyze different types of malware.
2. Able to learn tools available for malware analysis.

UNIT 1: (~9 Lecture Hours**)**

Introduction: The cyber kill chain, Definition of malware and its role in the kill chain, Different types of malware, the goal of malware analysis, Types of malware analysis, Setting up a safe environment for malware analysis

Analyzing malicious Windows programs: The Portable Executable file format, PE header and sections, The Windows loader, Windows API, Import Address Table, Import functions, Export functions, System architecture, processes, threads, memory management, registry.PE files on disk and in memory.

UNIT 2: (~9 Lecture Hours**)**

Basic static analysis- Introducing concepts and tools for basic static analysis: hash functions, VirusTotal, strings, PEiD, PE Explorer, CFF Explorer, and Resource Hacker - Identifying file obfuscation techniques: packers and cryptors - Introduction to Yara.

Basic dynamic analysis: Introducing concepts and tools for basic dynamic analysis: Sysinternals tools, sandboxes - Persistence techniques.

Network analysis: Faking a network for safe malware analysis - Introduction to Wireshark. - Command and Control communication of malware.

UNIT 3: (~9 Lecture Hours**)**

Advanced analysis: Introduction to x86 architecture - Memory, instructions, opcodes, operands, registers, functions, stack - The difference between source code and compiled code. Examining simple examples using different compilers.

Advanced static analysis: Introduction to disassemblers and decompiles - Static code analysis with IDA/ Ghidra - Obfuscation techniques.

Advanced dynamic analysis: Introduction to debuggers. - Dynamic analysis with OllyDbg. - Process injection techniques and hooking. - User mode and kernel mode debugging.

Ransomware analysis: Cryptographic algorithms used by ransomware.Cryptographic flaws in ransomware.

UNIT 4: (~9 Lecture Hours**)**

Analysis of malicious documents: File formats: OLE2, OOXML, RTF and PDF, Malicious macro. Document exploits, e.g. exploit example for Equation editor vulnerability (CVE-2017- 11882). Introduction to oletools.

UNIT 5: (~8 Lecture Hours**)**

Defeat malware: Examples of how to use the information we got during malware analysis to defend against malware attacks, Threat Intelligence, IOCs.Security solutions.,

Open source tools: Yara, Snort/Suricata..

Text Books:

1. Michael Sikorski, Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" By William Pollock publishing.

Reference Books:

1. Michael Hale Ligh, Steven Adair, Blake Hartstien, Matthew Richard, Malware Analyst's Cookbook and DVD 2011 by Wiley Publishing.

Online Resources:

1. http://usdatavault.com/library/Windows%20Malware%20Analysis%20Essentials.pdf
2. https://zeltser.com/media/docs/intro-to-malware-analysis.pdf
3. https://github.com/wtsxDev/Malware-Analysis

Course Outcomes:

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

1. Point out the requirements of malware analysis.
2. Compare various static analysis methods used in malware analysis.
3. Understand various methods of dynamic analysis used for malware analysis.
4. Analyse the tools used in malware analysis.
5. Discover various security tools.

I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:521DH **3 0 0 3**

ETHICAL HACKING

(Program Specific Elective-2)

Prerequisites:-Nil-

Course Objectives:

1. Introduce the methodologies and framework of ethical hacking for enhancing the security.
2. Able to understand the Impacts of Hacking, Types of Hackers, Information Security Models, Information Security Program, and Business Perspective.
3. Planning a Controlled Attack, Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration).

UNIT 1: (~11 Lecture Hours**)**

Introduction: Hacking Impacts,

The HackerFramework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, and 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 2: (~ 10 Lecture Hours**)**

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 3: (~7 Lecture Hours**)**

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

Reconnaissance:Social Engineering, Physical Security, Internet Reconnaissance.

UNIT 4: (~9 Lecture Hours**)**

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, RootKits, applications, Wardialing, Network, Services and Areas of Concern.

UNIT 5: (~8 Lecture Hours**)**

Deliverable:The Deliverable, the Document, Overall Structure, Aligning Findings,Presentation.

Integration: Integrating the Results, Integration Summary, Mitigation, Defence Planning, Incident Management, Security Policy, Conclusion.

Text Books:

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

Reference Books:

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

Online Resources:

1. http://www.ethicalhackx.com/certified-ethical-hacking-ceh-v8/
2. https://www.tutorialspoint.com/ethical_hacking/index.htm
3. https://www.cybrary.it/course/ethical-hacking/
4. https://www.hackersonlineclub.com/online-ethical-hacking-training/

Course Outcomes:

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

1. Evaluate a network and system architecture to identify the vulnerabilities and attack vectors.
2. Identify security techniques used to protect the system and data.
3. Assess the use and availability of tools to support an ethical hack.
4. Gain the knowledge of interpreting the results of a controlled attack.
5. Understand the role of politics, inherent and imposed limitations and metrics for planning of attest.

I Year M.Tech. CNIS - I Sem **L T P C**
Course Code: 52150 **0 0 3 1.5**

ADVANCED DATA STRUCTURES LAB

(Common to CNIS & CSE)

Prerequisites:-Nil-

Course Objectives:

1. Write and execute programs in Java to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, hash tables and search trees.
2. Learn to implement various text processing & computational geometry algorithms.

List of Programs:

Week 1: Write Java programs to implement the following using an array.
a) Stack ADT b) Queue ADT

Week 2: Write Java programs to implement the following using a singly linked list.
a) Stack ADT b) Queue ADT

Week 3: Write a Java program to implement priority queue ADT.

Week 4: Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
a) Linear Probing b) Quadratic Probing

Week 5: Write a Java program to perform the following operations.
a) Construct a SKIPLIST b) Search c) Update Operation on Skip Lists

Week 6: Write a Java program to perform the following operations.
a) Construct a binary search tree of elements.
b) Search for a key element in the above binary search tree.
c) Delete an element from the above binary search tree.

Week 7: Write a Java program to perform the following operations
a) Insertion into a B-tree. b) Deletion from a B-tree.

Week 8: Write a Java program to perform the following operations
a) Insertion into an AVL-tree. b) Deletion from an AVL-tree.

Week 9: a) Write a Java program that implements Brute-Force algorithm for pattern matching.
b) Write a Java program that implementsBoyer Moorealgorithm.

Week 10: Write a Java program that implements KMP algorithm for pattern matching.

Week 11: Write a Java program to implement following algorithms:
a) Huffman coding b) Longest Common Subsequence Problem

Week 12: Write a Java program to perform the following operations:
a) Constructing a Quad Tree b) Searching a Quad Tree

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in JAVA, 3rd Edition, Pearson, 2012.
2. M T Goodrich and Roberto Tamassia, Algorithm Design, John Wiley, 2006.

Reference Books:

1. S.Sahni, Data structures, Algorithms and Applications in Java, 2nd Edition, Universities Press, 2005.
2. A.Drozdek, Data Structures and Algorithms in java, 3rd Edition, Cengage Learning, 2008.
3. J.R.Hubbard, Data Structures with Java, 2nd Edition, Schaum's Outlines, TMH, 2007.

Online Resources:

1. https://www.hackerrank.com
2. https://www.cdn.geeksforgeeks.org/advanced-data-structures/
3. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php

Course Outcomes:

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

1. Execute the programs for various data structures like stacks & queues.
2. Develop the programs for various non-linear data structures as linked lists, binary search tree, AVL tree and B-tree.
3. Build the programs for various advanced data structures for dictionaries etc.
4. Implement various text processing algorithms.
5. Solve algorithms for computational geometry.

I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:52151 **0 0 3 1.5**

INFORMATION SECURITY LAB

(Program Specific Elective-2)

Prerequisites: Knowledge of any programming language.

Course Objectives:

1. Understand various network security aspects.
2. Implement various cryptographic algorithms.
3. Implement authentication and digital signatures algorithms.

List of Programs:

Week 1: Implement the logic that contains a string (char pointer) with a value 'Hello world', XOR each character in this string with 0 and displays the result.

Week 2: Implement the logic that contains a string (char pointer) with a value 'Hello world', AND or/ and XOR each character in this string with 127 and display the result.

Week 3: Implement encryption and decryption using following techniquesa) Ceaser Cipherb) Play fair Cipher.

Week 4: Implement encryption and decryption using following techniquesa) Hill Cipher b) Rail fence, row & Column Transformation.

Week 5: Implement Blowfish algorithm.

Week 6: Implement AES algorithm.

Week 7: Implement RC4 algorithm.

Week 8: Implement RSA algorithm.

Week 9: Implement the Diffie-Hellman Key Exchange mechanism.

Week 10: Calculate the message digest of a text using the SHA algorithm.

Week 11: Calculate the message digest of a text using the MD5.

Week 12: Implement Digital signatures on a given text.

Text Books:

1. Michael Gregg, Build Your Own Security Lab, Wiley India.

Reference Books:

1. Cryptography and Network Security, Principles and Practices: William Stallings, 7thEdition Prentice Hall.

Online Resources:

1. https://www.cybrary.it/catalog
2. http://cse.iitd.ernet.in/~murali/crypt
3. ttps://csrc.nist.gov/Projects/Block-Cipher-Techniques
4. https://www.udemy.com/build-your-own-cyber-lab-at-home
5. https://www.cyderaces.org/tutorials

Course Outcomes:

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

1. Implement various substitution and transpositiontechniques.
2. Implement various Cryptographic algorithms.
3. Implement various Authentication techniques.
4. Understand and implement Key Exchange techniques.
5. Implement various Hash Functions and Digital Signatures.

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I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:52152 **0 0 3 1.5**

MALWARE ANALYSIS LAB

(Program Specific Elective-2)

Prerequisites: Computer Programming.

Course Objectives:

1. Ability to understand the usage of various tools for malware analysis.
2. Ability to understand the tools available for debugging.
3. Ability to understand tools for analyzing network traffic, dissecting malware in memory images.

Learn to use the following tools for malware Analysis:

1. Antivirus and other malware identification tools
   a. YARA
2. Web-based multi-AV scanners and malware sandboxes for automated analysis.
   a. CUCKOO/Virus Total
3. Domain analysis Tools
   a. WHOIS
4. Debugging and Reverse Engineering
   a. IDA Pro - Windows disassembler and debugger, with a free evaluation version.
   b. WInDbg: multipurpose debugger for the Microsoft Windows computer operating system, used to debug user mode applications, device drivers, and the kernel-mode memory dumps.
   c. X64Dbg: An open-source x64/x32 debugger for windows.
5. Analyze network interactions
   a. WireShark: The Network Traffic analysis tools
6. Tools for dissecting malware in memory images or running systems
   a. WindDbg: Live memory inspection and kernel debugging for Windows systems.

Text Books:

1. Michael Hale Ligh, Steven Adair, Blake Hartstien and Matthew Richard, Malware Analyst's Cookbook and DVD 2011 by Wiley Publishing.

Reference Books:

1. Michael Sikorski and Andrew Honig "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" By Williampollock publishing.

Online Resources:

1. https://resources.infosecinstitute.com/step-by-step-tutorial-on-reverse-engineering-malware-the-zeroaccessmaxsmiscer-crimeware-rootkit
2. https://doc.lagout.org/security/Malware%20%26%20Forensics/Practical%20Malware%20Analysis.pdf
3. https://www.crysys.hu/downloads/vihimb01/2017/MW-meres.pdf
4. https://www.coursera.org

Course Outcomes:

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

1. Demonstrate the usage of malware and reverse engineering and various tools.
2. Application of tools and techniques of malware analysis.
3. Understand memory forensics tools.
4. Application of tools for dynamic analysis.
5. Application of YARA for malware analysis.

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I Year M.Tech. CNIS - I Sem **L T P C**
Course Code:52153 **0 0 3 1.5**

ETHICAL HACKING LAB

(Program Specific Elective-2)

Prerequisites: Knowledge of TCP/IP.

Course Objectives:

1. To introduce students to various Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack.
2. To implement the methodologies and framework of ethical hacking for enhancing the security.

List of Programs:

Week 1: Using Active and Passive Techniques for scanning Networks, Enumeration, Sniffing to Enumerate Network Hosts.

Week 2: Conducting Active and Passive Footprinting and Reconnaissance against Target.

Week 3: Using Armitage to Attack the Network.

Week 4: Using Metasploit to Attack a Remote System - Scanning Networks, Enumeration, Sniffers, Evading IDS, Firewalls, and Honeypots.

Week 5: Using Malware – Dark Comet for System Hacking, Trojans and Backdoors, Viruses and Worms.

Week 6: Using the SHARK Remote Administration Tool for System Hacking, Trojans and Backdoors, Viruses and Worms.

Week 7: Attacking a System- Using the SYSTEM account – System Hacking, Intrusion Detection –Evading IDS, Firewalls and Honeypots.

Week 8: Packet sniffing techniques and how to defend against sniffing.

Week 9: Social Engineering techniques, identify theft, and social engineering countermeasures.

Week 10: Penetration Testing and justification of penetration testing through risk analysis.

Week 11: Web-Based Hacking Servers and Applications for exploitation with IPv6 – System Hacking, Denial of Service, SQL Injection – Hacking Webservers, Hacking Web Applications, SQL Injection, Launching a Buffer Overflow – System Hacking, Buffer Overflow.

Week 12: Cryptography - Breaking Windows Passwords –System Hacking, Using John the Ripper to Crack Linux Passwords – System Hacking, Using Certificates to Encrypt Email–Cryptography.

Text Books:

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

Reference Books:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
2. Michael Simpson and Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.
3. Greg Meyer and Steven Casco (2002) Hack proofing ColdFusion, Syngress Publishers.
4. Harold F. Tipton and Micki Krause (2004) Information security management handbook, 5th Edition, CRC Press Publications, pp. 2036.

Course Outcomes:

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

1. Evaluate a network and system architecture to identify the vulnerabilities and attack vectors.
2. Identify security techniques used to protect the system and data.
3. Gain the knowledge of the use and availability of tools to support an ethical hack.
4. Gain the knowledge of interpreting the results of a controlled attack.
5. Prepare Deliverables and use them productively for enhancing mitigation and developing remedies for vulnerabilities.

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I Year M.Tech. CNIS I-Semester **L T P C**
Course Code:521DJ **2 0 0 2**

RESEARCH METHODOLOGY AND IPR

Prerequisites:-Nil-

Course Objectives:

1. To develop an understanding of IPR/ research methodology in the process of creation of patents through research.
2. To develop further research capabilities.

UNIT 1: (~7 Lecture Hours**)**

Research Methodology: Objectives and Motivation of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Methods, Importance of Research Methodology, Research Process, Criteria of Good Research.

UNIT 2:(~6 Lecture Hours**)**

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Design of Experimental Set-up, Use of Standards and Codes, Data collection methods, Collection of primary data, Secondary data, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data.

UNIT 3: (~ 5 Lecture Hours**)**

Research Report Writing: Format of the Research report, Synopsis, Dissertation, References/Bibliography/ Webliography, Research Proposal Preparation: Writing a Research Proposal and Research Report, Writing Research Grant Proposal. Introduction to the use of software tools:Grammarly, Overleaf and References function in Microsoft word.

UNIT4: (~5 Lecture Hours**)**

Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation.

UNIT 5: (~8 Lecture Hours**)**

Patent Rights: Scope of Patent Rights, Licensing and transfer of technology. Patent information and databases. New Developments in IPR: Administration of Patent System.

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique".New Age InternationalPublishers, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011.
3. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
4. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.
5. Satarkar, S.V,."Intellectual property rights and copy right". ESS Publications,2000.

Reference Books:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by StepGuide forbeginners, 2012.
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_hs55
   (Course Title: Patent Law for Engineers and Scientists, by Dr. Feroz Ali (IIT Madras))
2. https://onlinecourses.nptel.ac.in/noc20_hs54
   Course Title: Patent Drafting for Beginners, by Dr. Feroz Ali (IIT Madras))

Course Outcomes:

After completion of the course the student should be able to:

1. Describe research problem formulation and outline the Research Design process.
2. Identify the various methods of Data Collection.
3. Demonstrate the ability to draft Research Report, Synopsis and Dissertation with appropriate Bibliography/Webliography while conforming to research ethics.
4. Categorize various forms of Intellectual Property and list out the steps involved in Patenting.
5. Justify the need for Patenting and Transfer of Technology in the socio-economic growth of the society.
6. Develop a Research Proposal and Research Grant Proposal.

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I Year M.Tech. CNIS II-Semester **L T P C**
Course Code:522DK **3 0 0 3**

ADVANCED ALGORITHMS

(Common to CNIS & CSE)

Prerequisites: Advanced Data Structures.

Course Objectives:

1. Introduce advanced methods of designing and analysing algorithms.
2. Choose appropriate algorithms and use it for a specific problem.
3. Familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Introduce the recent developments in algorithmic design.

UNIT 1: (~10 Lecture Hours**)**

The Role of Algorithms in Computing: Algorithms, Algorithms as a technology,

Searching & Sorting- Linear search and Binary search, Internal and External sorting, Insertion Sort, Heap Sort, Quick Sort, Topological sorting, Time/space analysis.

UNIT 2: (~10 Lecture Hours**)**

Graph: Elementary Graph Algorithms, MST, Single-Source Shortest Path, All Pair Shortest Path

Maximum Flow: Flow Networks, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

UNIT 3: (~8 Lecture Hours**)**

Divide-and-Conquer: Introduction, The Maximum-subarray problem, Stassen's algorithm for matrix multiplication, Substitution Method, Recurrence –Tree Method, Master Method, Proof of Master Theorem.

UNIT 4: (~9 Lecture Hours**)**

Dynamic Programming: Rod Cutting, Matrix Chain Multiplication, Elements of dynamic programming, longest common subsequence, Optimal binary search tree.

Greedy Algorithms: An activity-selection problem, Elements of the greedy strategy, Huffman codes.

UNIT 5: (~8 Lecture Hours**)**

String Matching: The naive string-matching algorithm, The Rabin-Karp algorithm, String matching with finite automata.

NP Completeness: Polynomial time, Polynomial time verification, NP Completeness and reducibility, NP Complete Problems.

Text Books:

1. Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithms", 3rd Edition, MIT Press, 1990.

Reference Books:

1. Mark A. Weiss, Data Structures and Algorithm Analysis in Java,3rd Edition, Pearson, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Addison-Wesley Publication, 1974.

Online Resources:

1. http://nptel.ac.in/courses/106104019/
2. https://www.coursera.org/learn/advanced-algorithms-and-complexity
3. https://www.udemy.com/course/advanced-algorithms-in-java/

Course Outcomes:

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

1. Design efficient algorithms for any complex real world problems.
2. Analyze the complexity/performance of different algorithms.
3. Assessing data using graphs and flow networks in various applications.
4. Apply different designing methods such as divide and conquer, dynamic programming and greedy methods, for development of algorithms to realistic problems.
5. Formulate algorithms for NP hard and NP complete problems.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DL **3 0 0 3**

SOFT COMPUTING

(Common to CNIS & CSE)

Prerequisites:-Nil-

Course Objectives:

1. Introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. Implement soft computing based solutions for real-world problems.
3. Give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic and genetic algorithms.
4. Analyze and Apply Genetic Algorithms to combinatorial optimization problems.

UNIT 1: (~7 Lecture Hours**)**

Introduction to Soft Computing and Neural Networks: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics: Supervised, Unsupervised and Reinforcement Learning.

UNIT 2: (~10 Lecture Hours**)**

Fuzzy Logic: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Defuzzification, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making. Study of fuzzy logic toolbox.

UNIT 3: (~11 Lecture Hours**)**

Neural Networks: Machine Learning using Neural Network Basics, Supervised Learning Neural Networks: Introduction, Perceptrons, Adaline, Backpropagation Multilayer Perceptrons, Radial Basis Function Networks, Modular Networks, Study of Neural Network toolbox.

Adaptive Networks: Architecture, Backpropagation for Feed Forward Networks, Extended Backpropagation for Recurrent Networks, Hybrid Learning Rule.

UNIT 4: (~10 Lecture Hours**)**

Advanced Neural Networks Unsupervised Learning Neural Networks: Introduction, Competitive Learning Networks, Kohonen Self-Organizing Networks, Hebbian Learning, Principal Component Networks, Hopfield Networks.

Reinforcement Learning: Q-Learning, Simple implementation of Artificial Neural Network and Fuzzy Logic.

UNIT 5: (~10 Lecture Hours**)**

Genetic Algorithms (GA): Introduction, Biological Background, Traditional optimization and search techniques, Search Space, Genetic Algorithm (GA) VsTraditional Algorithms, Basic Terminologies, Simple and General GA, Operators in GA, Stopping Condition for GA flow, Problem solving using GA, Classification of GA's: Messy, Adaptive, Hybrid and parallel. Applications of GA.

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun and EijiMizutani, NeuroFuzzy and Soft Computing, Prentice-Hall of India/PHI, 2003.
2. S.N Sivanandam and S.N. Deepa, Principles of Soft Computing, Wiley India 2007.

Reference Books:

1. David E Goldberg, Genetic Algorithms in Search Optimization and machine learning, Addison-Wesley, 1989.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 1995.
3. Russell and Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.

Online Resources:

1. www.soukalfi.edu.sk/01_NeuroFuzzyApproach.pdf.
2. https://drive.google.com/file/d/0B0z1V-RAPGVkT2MyTXlwdE9XWXc/view?usp=sharing.
3. https://github.com/rohanchikorde/Data-Science-books/blob/master/python-machine-learning-2nd.pdf.
4. http://www.myreaders.info/html/soft_computing.html.

Course Outcomes:

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

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Understand and apply concept of artificial neural networks.
3. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
4. Apply genetic algorithms to combinatorial optimization problems.
5. Evaluate and compare solutions by various soft computing approaches for a given problem.
6. Recognize the underlying mathematics and logic behind various soft computing algorithms.

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I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DM **3 0 0 3**

SECURE SOFTWARE ENGINEERING

(Program Specific Elective-3)

Prerequisites:-Nil-

Course Objectives:

1. To learn the software security from project manager perspective.
2. Will acquire insight into difference between software product with security and without security.
3. Understand resist, tolerate, and recover from attacks more effectively.
4. Understand set of processes, policies, and techniques that are appropriate for its security maturity, risk tolerance, and development style.

UNIT 1: (~9 Lecture Hours**)**

Security a software Issue: introduction, the problem, Software Assurance and Software Security, Threats to software security, Sources of software insecurity, Benefits of Detecting Software Security What Makes Software Secure: Properties of Secure Software, Influencing the security properties of software, Asserting and specifying the desired security properties?

UNIT 2: (~8 Lecture Hours**)**

Requirements Engineering for secure software: Introduction, the SQUARE process Model, Requirements elicitation and prioritization.

UNIT 3: (~10 Lecture Hours**)**

Secure Software Architecture and Design: Introduction, software security practices for architecture and design: architectural risk analysis, software security knowledge for architecture and design: security principles, security guidelines and attack patterns Secure coding and Testing: Code analysis, Software Security testing, Security testing considerations throughput the SDLC.

UNIT 4: (~9 Lecture Hours**)**

Security and Complexity: System Assembly Challenges: introduction, security failures, functional and attacker perspectives for security analysis, system complexity drivers and security.

UNIT 5: (~9 Lecture Hours**)**

Governance and Managing for More Secure Software: Governance and security, adopting an enterprise software security framework, how much security is enough? Security and project management, Maturity of Practice.

Text Books:

1. Software Security Engineering: Julia H. Allen, Pearson Education.

Reference Books:

1. Developing Secure Software: Jason Grembi, Cengage Learning.
2. Software Security: Richard Sinn, Cengage Learning.

Online Resources:

1. https://www.coursera.org/specializations/secure-software-design.
2. https://www.researchgate.net/publication/328416320_Secure_Software_Engineering_Training.
3. https://www.ijikm.org/Volume5/IJIKMv5p083-099Talib453.pdf.
4. https://dl.acm.org/doi/10.1145/3383219.3383290.
5. https://ieeexplore.ieee.org/document/9328095.

Course Outcomes:

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

1. Differentiate key concepts and techniques required to understand security and threats associated with software.
2. Analyse the requirement discovery based on square process model.
3. Compile software security practices for architecture and design.
4. Illustrate security analysis, system complexity drivers and security from attackers' perspective.
5. Understand the level of security required for an enterprise software security framework.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DN **3 0 0 3**

DIGITAL FORENSICS

(Program Specific Elective-3)
(Common to CNIS & CSE)

Prerequisites: -Nil-

Course Objectives:

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools.
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics.

UNIT 1: (~9 Lecture Hours**)**
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics.

UNIT 2: (~8 Lecture Hours**)**
Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT 3: (~9 Lecture Hours**)**
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define theworkload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT 4: (~10 Lecture Hours**)**
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case.
Network Forensics: Open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT 5: (~12 Lecture Hours**)**
Mobile Forensics: Mobile forensics techniques, Mobile forensics tools.
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.

Text Books:

1. John R. Vacca, Computer Forensics, Computer Crime SceneInvestigation, 2nd Edition,Charles River Media, Inc.
2. John Sammons, The Basics of Digital Forensics, Elsevier.

Reference Books:

1. Tony Sammes and Brian Jenkinson, Forensic Computing, A Practitioner's Guide, Springer International edition.
2. Dr. Darren R. Hayes, A Practical Guide to Computer Forensics Investigations PearsonEducation Inc.
3. Christopher L.T. Brown, Computer Evidence: Collection and Presentation, 2nd Edition, Cengage Learning.
4. Robert M.Slade, Software Forensics Collecting Evidence from the Scene of a Digital Crime, 1st Edition, TMH.

Online Resources:

1. https://www.cs.nmt.edu/~df/Lecture Hours.html
2. https://booksite.elsevier.com/samplechapters/9780123742681/Chapter_1.pdf
3. https://www.cs.purdue.edu/homes/ninghui/courses/426_Fall10/handouts/CS426_forensics.pdf

Course Outcomes:

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

1. Understand the need of digital forensics.
2. Understand application of computer forensics and digital detective and various processes, policies and procedures.
3. Explore E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Understand the requirements of Email and web forensics and network forensics.
5. Demonstrate usage of various forensic tools for a wide variety of investigations.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DP **3 0 0 3**

CLOUD SECURITY

(Program Specific Elective-3)

Prerequisites:-Nil-

Course Objectives:

1. Understand the fundamentals of cloud computing.
2. Understand the requirements for an application to be deployed in a cloud.
3. Become knowledgeable in the methods to secure cloud.

UNIT 1: (~9 Lecture Hours**)**

Cloud Computing Fundamentals: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud;

Business Agility: Benefits and challenges to Cloud architecture.

UNIT 2: (~9 Lecture Hours**)**

Cloud Applications: Technologies and the processes required when deploying web services, Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages- Development environments for service development; Amazon, Azure, Google App.

UNIT 3: (~10 Lecture Hours**)**

Securing The Cloud: Security Concepts - Confidentiality, privacy, integrity, authentication, nonrepudiation, availability, access control, defence in depth, least privilege- how these concepts apply in the cloud and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud.

UNIT 4: (~10 Lecture Hours**)**

Virtualization Security: Multi-tenancy Issues: Isolation of users/VMs from each other- How the cloud provider can provide this- Virtualization System Security Issues: e.g. ESX and ESXi Security, ESX file system security- storage considerations, backup and recovery- Virtualization System Vulnerabilities.

UNIT 5: (~10 Lecture Hours**)**

Cloud Security Management: Security management in the cloud – security management standards SaaS, PaaS, IaaS availability management- access control- Data security and storage in cloud.

Text Books:

1. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1st edition [ISBN: 978- 0521137355], 2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", Tata McGraw-Hill Osborne Media; 1 edition 22, [ISBN: 0071626948], 2009.

Reference Books:

1. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly Media; 1 edition, [ISBN: 0596802765], 2009.
2. Ronald L. Krutz, Russell Dean Vines, "Cloud Security", Wiley [ISBN: 0470589876],2010.

Online Resources:

1. https://docs.aws.amazon.com/
2. https://cloud.google.com/docs
3. https://docs.microsoft.com/en-us/azure/
4. https://www.vmware.com/pdf/vi3_35/esx_3/r35u2/vi3_35_25_u2_intro_vi.pdf
5. https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/partners/netapp/designing-secure-multi-tenancy-into-virtualized-data-center.pdf

Course Outcomes:

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

1. Analyze the fundamental concepts and architecture of cloud computing.
2. Examine cloud developmental environments and web services deployment on cloud.
3. Inspect cloud security management.
4. Interpret Virtualization system security issues and their vulnerabilities.
5. Analyze the various standards for Cloud computing and its management.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DQ **3 0 0 3**

INTERNET OF THINGS AND SECURITY

(Program Specific Elective-4)

Prerequisites: -Nil-

Course Objectives:

1. To impart necessary and practical knowledge of Internet of Things and its devices.
2. To understand the related technologies connected to IoT.
3. To understand the foundations of security in IoT.
4. To understand the basic principles and functions of cryptography for IoT.
5. To explore the main threats and attacks on IoT and cloud based IoT environments.

UNIT 1: (~9 Lecture Hours**)**

Introduction to Internet of Things-Definition and characteristics of IoT, Physical Design of IoT-IoT Protocols, IoT Communication Models, IoT Communication APIs. IoT enabling Technologies- IoT Levels and Templates.

IoT Physical Devices and Endpoints-Introduction to Raspberry Pi Interfaces (serial, SPI, I2C) Programming-Python program with Raspberry Pi with focus of interfacing external gadgets, Controlling Output and Reading input from pins.

UNIT 2: (~9 Lecture Hours**)**

IoT and M2M-Software Defined Networks, Network Function Virtualization, Difference between SDN and NFV for IoT.

Basics of IoT System Management – SNMP, NETCONF, YANG, and NETOPEER.

UNIT 3: (~9 Lecture Hours**)**

Securing the Internet of Things -Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications.

Security Architecture in the IoT-Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT.

UNIT 4: (~9 Lecture Hours**)**

Cryptographic Fundamentals For IoT - Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols.

UNIT 5: (~9 Lecture Hours**)**

Cloud Security For IoT - Cloud services and IoT – offerings related to IoT from cloud service providers. Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing.

Text Books:

1. ArshdeepBahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.
2. Russell, Brian and Drew Van Duren, "Practical Internet of Things Security", Packt Publishing, 2016.

Reference Books:

1. Fei HU, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC Press,2016.
2. Li, S. and Da Xu, L.,. Securing the internet of things. Syngress. 2017.
3. David, Hanes and Salgueiro Gonzalo, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Pearson 2017.

Online Resources:

1. https://www.theinternetofthings.eu.
2. https://onlinecourses.nptel.ac.in/noc17_cs22.
3. https://www.udacity.com.
4. https://www.coursera.org.

Course Outcomes:

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

1. Understand building blocks of Internet of Things and characteristics.
2. Compare and contrast the related technologies connected to IoT.
3. Demonstrate various security aspects of IoT.
4. Illustrate the various cryptographic techniques for IoT.
5. Assess the threats and attacks on IoT and cloud based IoT environments.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DR **3 0 0 3**

WEB AND DATABASE SECURITY

(Program Specific Elective-4)

Prerequisites: -Nil-

Course Objectives:

1. Give an Overview of information security.
2. Give an overview of Access control of relational databases.

UNIT 1: (~9 Lecture Hours**)**

The Web Security: The Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification.

UNIT 2: (~9 Lecture Hours**)**

The Web Privacy: The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications.

UNIT 3: (~9 Lecture Hours**)**

Database Security Models-discretionary access control (DAC), which bases access decisions on users' identity; mandatory access control (MAC), which bases access decisions on mandated regulations defined by a central authority; and role-based access control (RBAC).

Access Control Models for XML:XML Access Control Requirements, Fine Grained XML Access Control System, Access Control Enforcement, Static Analysis.

UNIT 4: (~9 Lecture Hours**)**

Database Issues in Trust Management and Trust Negotiation: Introduction to Trust Management, what is Trust Management?

Trust Management Systems: Policy Maker and Key Note, SPKI/SDSI, QCM and SD3, RT, OASIS and Cassandra, Evaluation Problems and Strategies., Trust Negotiation Implementations.

UNIT 5: (~9 Lecture Hours**)**

Security Re-engineering for Databases: Introduction, Insider Misuse and Anomaly Detection, Data profiling, User Profiling.

Database Watermarking for Copyright Protection: Introduction, Model, Numeric Types, Categorical types.

Text Books:

1. Web Security, Privacy and Commerce, Simson G. Arfinkel, Gene Spafford, O' Reilly.
2. Handbook on Database security applications and trends, Michael Gertz, SushilJajodia.

Reference Books:

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
2. Database security by alfredbasta, melissazgola, CENGAGE learning.

Online Resources:

1. Database Security (oracle.com)

Course Outcomes:

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

1. Describe requirements for web application security and Database Security.
2. Compare security mechanisms used for web applications.
3. Assess the methods used to protect the data from insider attacks.
4. Understand security models used for database, XML.
5. Classify the tools used for securing the database.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:522DS **3 0 0 3**

CYBER SECURITY

(Program Specific Elective-4)

Prerequisites: Basic knowledge of computer networks.

Course Objectives:

1. To learn key concepts of Cyber Security, Cyber Laws and Cyber Forensics.
2. To safe-guard the individual, society, organization and the government from the dangers by identifying the cyber-attacks.
3. To identify frauds, attacks in mobile and wireless devices.
4. Able to examine emerging technologies and the security-related challenges they pose.

UNIT 1: (~9 Lecture Hours**)**

Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cyber criminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Cyber offenses: How Criminals Plan Them: Introduction, How Criminals Plan Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, and Cloud Computing.

UNIT 2: (~ 10 Lecture Hours**)**

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.

Cyber Intelligence, Cyber Conflicts, and Cyber Warfare: Introduction, Information Warfare Theory and Application, Cyber Intelligence and Counter Intelligence, DoD-The U.S. Cyber Command, Nation-State Cyber Conflicts, Cyber Warfare and the Tallinn Manual on International Law.

UNIT 3: (~8 Lecture Hours**)**

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

UNIT 4: (~8 Lecture Hours**)**

Cybersecurity Threat Landscape and Future Trends: Introduction, Breaches—Global Data, Threat Landscape-Traditional Threats, Social Engineering Threats, Buffer Overflow and Structured Query Language Injection, Next-Generation Threats, Attacker's Need for Information, Transformational Changes for Cybersecurity: Virtualization, social media, Internet of Things, Cloud Computing, Big Data, Preparing Future Generations for Cybersecurity Transformational Challenges.

UNIT 5: (~9 Lecture Hours**)**

Understanding Computer Forensics: Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing.

Text Books:

1. Nina Godbole and Sunil Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley INDIA.
2. Thomas A. Johnson, CYBERSECURITY Protecting Critical Infrastructures from Cyber Attack and Cyber Warfare, CRC Press Taylor & Francis Group.

Reference Books:

1. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, CRC Press.

Online Resources:

1. https://www.xenonstack.com/blog/artificial-intelligence-cyber-security
2. https://www.geeksforgeeks.org/role-of-blockchain-in-cybersecurity/
3. https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
4. https://www.bt.com.au/professional/knowledge-centre/business-resources/business-development/targeted-malware-attacks.html
5. https://www.udemy.com/course/the-complete-artificial-intelligence-for-cyber-security-2021/
6. https://www.itbusinessedge.com/security/potential-use-cases-of-blockchain-technology-for-cybersecurity/

Course Outcomes:

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

1. Understand basic concepts of Cyber Security.
2. Interpret security issues in computer systems and mobile devices.
3. Investigate security incidents in the cyber world.
4. Understand risk management policies in Cyber Security.
5. Analyse transformational changes and Challenges in emerging technologies.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code:52256 **0 0 3 1.5**

ADVANCED ALGORITHMS LAB

(Common to CNIS & CSE)

Prerequisites: Programming for Problem Solving.

Course Objectives:

1. Write and execute programs in Java to implement advanced algorithms.
2. Choose an appropriate design paradigm to solve problems.

List of Programs:

Week 1 : Write Java programs to implement the following using arrays or linked list:
a) Stack b) Queue

Week 2 : Write Java programs to implement and analyze the Quicksort.

Week 3 : Write Java programs to implement and analyze the Heapsort.

Week 4 : Write a Java program to implement the following:
a) Prim's Algorithm b) Kruskal's Algorithms

Week 5 : Write a Java program to implement the functions following:
a) Single-Source Shortest Path b) All Pairs Shortest Path

Week 6 : Write a Java program to analyse the Edmond-karp Algorithm.

Week 7 : Write a Java program to implement the following:
a) Maximum Sub-array problem b) Strassen's Matrix Multiplication

Week 8 : Write a Java program to implement the following:
a) Rod cutting b) Longest Common Subsequence.

Week 9 : Write a Java program to implement the Matrix Chain Multiplication.

Week 10: Write a Java program that implements Optimal Binary Search Tree (OBST).

Week 11: Write a Java program that implements the Huffman codes.

Week 12: Write a Java program to implement Rabin-Karp Algorithm.

Reference Books:

1. Mark A. Weiss, Data Structures and Algorithm Analysis in Java, 3rd Edition, Pearson, 2012.
2. Aho, Hopcroft and Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Addison-Wesley Publication, 1974.
3. Jon Kleinberg and Eva Tardos, "Algorithm Design", 1st Edition, Pearson, 2006.

4. SartajSahni, "Data Structures, Algorithms and Applications in JAVA", 2nd Edition, Universities Press, 2005.

Online Resources:

1. https://www.hackerrank.com
2. https://codetantra.com

Course Outcomes:

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

1. Analyze and implement advanced sorting and searching techniques.
2. Implement various applications related to graphs and flow networks.
3. Solve problems related to divide and conquer strategy.
4. Develop the dynamic programming algorithms and analyse.
5. Apply different designing methods for development of algorithms to realistic problems using greedy method.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code: 52257 **0 0 3 1.5**

INTERNET OF THINGS AND SECURITY LAB

(Program Specific Elective-4)

Prerequisites: -Nil-

Course Objectives:

1. To impart necessary and practical knowledge of components of Internet of Things.
2. To understand the related technologies connected to IoT.
3. To understand the foundations of security in IoT.
4. To understand the basic principles and functions of cryptography for IoT.
5. To explore the main threats and attacks on IoT and cloud based IoT environments.

List of Programs:

Week 1: Blinking LED through Raspberry pi.

Week 2: IoT sensors interface with Raspberry pi (Temperature/Light sensors).

Week 3: Integration of Actuators with Raspberry pi (Servo motor/Relay).

Week 4: Capture Image with Raspberry pi.

Week 5: Cron task scheduling on Raspberry Pi OS.

Week 6: Design Traffic control system using Raspberry pi.

Week 7: Implementing IoT smart home application using Raspberry pi.

Week 8: IoT Radio Security Analysis - Exploitation of communication protocols (BLE).

Week 9: IoT Radio Security Analysis – Sniffing radio packets.

Week 10: IoT Device hardware penetration testing for identifying open ports (tampering).

Week 11: IoT Device hardware penetration testing for Internal Communications Protocols (UART/I2C/SPI).

Week 12: IoT Firmware penetration testing – Analyzing different file system.

Text Books:

1. ArshdeepBahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.
2. Aaron Guzman and Aditya Gupta, “IoT penetration testing cookbook: Identify vulnerabilities and secure your smart devices”, Packt Publishing, 2017.

Reference Books:

1. Russell, Brian and Drew Van Duren, "Practical Internet of Things Security", Packt Publishing, 2016.
2. Fei HU, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC Press,2016.
3. Li, S. and Da Xu, L.,. *Securing the internet of things*. Syngress. 2017.
4. David, Hanes and Salgueiro Gonzalo, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Pearson 2017.

Online Resources:

1. https://www.tutorialspoint.com.
2. https://www.edureka.co.

Course Outcomes:

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

1. Understand Internet of Things hardware and software components.
2. Test and experiment different sensors and actuators for application development.
3. Build real world IoT applications.
4. Evaluate security issues in IoT applications.
5. Analyse the threats and attacks in IoT.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code: 52258 **0 0 3 1.5**

WEB AND DATABASE SECURITY LAB

(Program Specific Elective-4)

Prerequisites: -Nil-

Course Objectives:

1. Understand the principles for implementation of web security.
2. Understand the principle for implementing Database Security.
3. Implementation of access control methods for Database Security.

List of Experiments:

1. Creation and manipulation of database using SQL scripts and graphicalinterfaces.
2. Implementing DAC: Implementation of database security policies using DAC inoracle 10g/SQL server.
3. Implementing of MAC to ensure confidentiality and control information flow using either Oracle 10g or SQL server. This provides exposure to understand the concepts of MAC and Trojan hose.
4. Implementation of Virtual Private Database using View using Oracle 10g or SQL server.
5. Design a method to simulate the HTML injections and cross-site scripting (XSS) to exploit the attackers.
6. Determine HTML injection bugs and possible measures to prevent HTML injection exploits.
7. Implement Secure coding for buffer flow heap attacks.
8. Implementation of Design methods to break authentication schemes.
9. Implementation of methods for abusing Design Deficiencies against web sites.

Text Books:

1. Web Security, Privacy and Commerce, Simson G. Arfinkel, Gene Spafford, O' Reilly.
2. Handbook on Database security applications and trends, Michael Gertz, SushilJajodia.

Reference Books:

1. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
2. Database security by alfredbasta, melissazgola, CENGAGE learning.

Online Resources:

1. Database Security (oracle.com).

Course Outcomes:

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

1. Design of access control methods for secure web & database application development.
2. Analyze and classify the vulnerabilities in the Web and Database applications.
3. Design and implementation various methods for web security.
4. Design and implementation various methods for database intrusion detection.
5. Design and Implementation security audit methods.

I Year M.Tech. CNIS - II Sem **L T P C**
Course Code: 52259 **0 0 3 1.5**

CYBER SECURITY LAB

(Program Specific Elective-4)

Prerequisites: Basic knowledge of computer networks.

Course Objectives:

1. To introduce students to various Cyber Security Models to detect vulnerable devices.
2. To use different open source tools for network scanning and analysis.
3. To demonstrate Cyber Security tools for planning a controlled attack.
4. To protect data and respond to threats that occur over the OS, Networks and Internet by using penetration testing.

List of Programs:

Week 1: Introduction to Cyber Security tools.

Week 2: Information Gathering and Reconnaissance attack using software tools.

Week 3: Vulnerability scanning and analysis for Linux & Windows OS.

Week 4: Vulnerability scanning and analysis for networks.

Week 5: Web vulnerability scanning and analysis.

Week 6: Perform Network Sniffing/Packet Sniffing.

Week 7: Implement Malware Analysis.

Week 8: Perform Penetration Testing.

Week 9: Generate and Analyze SQL Injection Attacks.

Week 10: Study Email Traffic for Phishing & virus attack.

Week 11: Implement Cyber Security analysis life cycle on any web application.

Week 12: Cyber Security analysis on any web application using penetration testing.

Text Books:

1. Sanjib Sinha, Beginning Ethical Hacking with Kali Linux, Computational Techniques for Resolving Security Issues Apress.

Reference Books:

1. Jon Erickson, Hacking: The Art Of Exploitation, No Starch Press 2003.
2. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press San Francisco, 2014.

Online Resources:

1. https://onlinecourses.swayam2.ac.in/nou21_ge40/preview
2. https://www.udemy.com/course/ethical-hacking-basics-kali-20211/
3. https://www.softwaretestinghelp.com/how-to-use-burp-suite/
4. https://www.udemy.com/course/sql-injection-ethical-hacking/
5. https://nptel.ac.in/courses/106106178
6. https://www.koenig-solutions.com/malware-analysis-training-course

Course Outcomes:

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

1. Understand basic concepts and tools in cybersecurity.
2. Analyse Information Gathering and Reconnaissance attack.
3. Apply cyber security tools for Network sniffing and Vulnerability scanning.
4. Demonstrate Malware analysis and penetration testing.
5. Implement the given system scenario using penetration testing in Web applications.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code:523DT **3 0 0 3**

BLOCKCHAIN TECHNOLOGY

(Program Specific Elective-5)

Prerequisites: Cryptography.

Course Objectives:

1. To enable students, develop understanding on Blockchain Technology
2. To equip students with knowledge on cryptocurrencies working.
3. To empower students, gain knowledge on Blockchain implementationtechnologies.

UNIT 1: (~6 Lecture Hours**)**

Blockchain 101: The History of blockchain and Bitcoin, Types ofBlockchain, Consensus.

Decentralization: Decentralization using Blockchain, Blockchain and Full Ecosystem, Platforms for Decentralization.

UNIT 2: (~8 Lecture Hours**)**

Introducing Bitcoin: Bitcoin, Digital Keys and Addresses, Transactions, Mining.

Bitcoin Network and Payments: Wallets.

Alternative Coins: Theoretical Foundations, Bitcoin limitations, Namecoin, Primecoin, Zcash.

Smart Contracts: Ricardian Contracts.

UNIT 3: (~10 Lecture Hours**)**

Ethereum 101: The Ethereum network, Components of the Ethereum ecosystem.

Further Ethereum: Programming Languages-Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols.

Development Tools and Frameworks: - Solidity Language.

UNIT 4: (~10 Lecture Hours**)**

Introducing Web3: Web3 – Contract Deployment, POST Requests, Development frameworks.

Hyperledger: Hyperledger as a protocol, The reference architecture, Fabric-Hyperledger Fabric– Distributed Ledger, Corda.

UNIT 5: (~10 Lecture Hours**)**

Alternative Blockchains: Blockchains- Kadena, Ripple, Rootstock, Quorum, Tezos, Storj, Maidsafe, BigchainDB, Multichain, Tendermint.

Scalability and Other Challenges: Scalability, Privacy.

Current Landscape and What's Next: Blockchain Research, Notable Projects, Miscellaneous Tools.

Text Books:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.

Reference Books:

1. ArshdeepBahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT, 2017.
2. Blockchain Technology, Chandramouli Subramanian, Asha A George, Abilash KA and MeenaKarthikeyan, Universities Press, 2020.
3. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing and Securing Distributed Blockchain-based projects, EladElrom, Springer Nature B.V, 2019.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105184/
2. https://github.com/rddill-IBM/ZeroToBlockchain
3. tech.seas.harvard.edu/free-blockchain
4. https://www.codecademy.com/learn/introduction-to blockchain/modules/fundamental-blockchain-concepts
5. The Basics of Blockchain & Bitcoin Fundamentals Course | Udemy

Course Outcomes:

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

1. Understand Blockchain Technology and its ecosystem.
2. Interpret how various cryptocurrencies work.
3. Articulate Ethereum Blockchain for developing smart contracts.
4. Extend knowledge on Web3 and Hyperledger Fabric in decentralized applications.
5. Exemplify emerging Blockchains and their real-time usage.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code: 523DU **3 0 0 3**

INTRUSION DETECTION AND PREVENTION SYSTEMS

(Program Specific Elective-5)

Prerequisites: Computer Networks.

Course Objectives:

1. To understand the concept of IDS/IPS.
2. To understand various Intrusion Detection tools and techniques in order to improve their security posture.
3. To plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.
4. To understand vulnerability assessment in wireless networks.

UNIT 1: (~8 Lecture Hours**)**

Security Threats and Threat Motives to Computer Networks: Sources of Security Threats, Security Threat Motives, Security Threat Management, Security Threat Correlation, Security Threat Awareness.

Computer network vulnerabilities: Sources of Vulnerabilities, Vulnerability Assessment, Firewalls.

UNIT 2: (~10 Lecture Hours**)**

Intrusion Detection and Prevention Technologies: Definition, Intrusion Detection, Intrusion Detection Systems (IDSs), Types of Intrusion Detection Systems, The Changing Nature of IDS Tools, Other Types of Intrusion Detection Systems, Response to System Intrusion, Challenges to Intrusion Detection Systems, Implementing an Intrusion Detection System, Intrusion Prevention Systems (IPSs), Intrusion Detection Tools.

IDS and IPS Architecture: Tiered Architectures: Single-Tiered, Multi-Tiered, Peer-To-Peer. **Sensors**: Sensor Functions, Sensor Deployment and Security. Agents: Agent Functions, Agent Deployment and Security. Manager Component: Manager Functions, Manager Deployment Considerations, Management Security Considerations.

UNIT 3: (~8 Lecture Hours**)**

A General IDS model and taxonomy, Signature-based Solutions, Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection, Evaluation of IDS, Cost sensitive IDS.

UNIT 4: (~9 Lecture Hours**)**

IDS &IPS Internals: Information Flow in IDS and IPS, Detection of Exploits, Malicious Code Detection, Output Routines, Defending IDS/IPS.

Implementation and Deployment: Internet Security System's Real Secure: Installation and Architecture, Configuring Real Secure, Cisco Secure IDS, SNORT, NFR Security.

UNIT 5: (~8 Lecture Hours**)**

IDS Management

Data Correlation: The Basics of Data Correlation: Data Correlation Definitions, The Value of Data Correlation,

Advanced Approaches To Data correlation and Fusion: Data Fusion, Alert Fusion, Understanding And Using Statistical correlation: The Basics Of Statistical Correlation, Correlation Coefficient, Statistical Inference, Pearson Product Moment Correlation, Bayesian Inference, Real Time Versus After The Fact Correlation.

Incident Response: Response Types, The Incident Response Process, , IDS and IPS Incident Response Phases, Forensics, Forensic Issues, Standard, Accountability, Public Relations,Rules of Evidence.

Text Books:

1. Joseph MiggaKizza, Guide to Computer Network Security, fifth edition, Springer, 2005.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2006.

Reference Books:

1. Ali A. Ghorbani, Wei Lu, MahbodTavallaee, Network Intrusion Detection and Prevention: Concepts and Techniques, springer, 2009

Online Resources:

1. https://flylib.com/books/en/2.352.1/ids_and_ips_architecture.html#fastmenu_2
2. https://www.coursera.org/learn/detecting-cyber-attacks#syllabus
3. https://onlinecourses.swayam2.ac.in/cec22_cs03/preview
4. https://www.javatpoint.com/types-of-cyber-attackers

Course Outcomes:

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

1. Examine security threats and vulnerabilities in computer networks.
2. Classify emerging IDS technologies.
3. Compare alternate tools and approaches for Intrusion detection.
4. Analyse Forensic Issues in IDS.
5. Evaluatedata correlation and incident response management techniques in IDS.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code: 523DV **3 0 0 3**

ETHICS AND LAWS OF CYBER SECURITY

(Program Specific Elective-5)

Prerequisites: Basic knowledge in computer networks.

Course Objectives:

1. To understand the basics of cyber law.
2. To understand ethical laws and related issues of cyber security for different countries.
3. To understand the foundations of cybersecurity, ethics and laws.
4. To outline various problems of the domain such as ethical hacking and best practices for cybersecurity professionals.

UNIT 1: (~9 Lecture Hours)

Introduction-Cyber Security and its Problem-Intervention Strategies: Redundancy, Diversity and Autarchy, The CIA Triad and Its Real world application.

Threats, Approaches for Attack and Defence, Threats and Solutions in: Data Security-Software Security- Network Security, Malware Threats and Solutions, Continuous Testing.

UNIT 2: (~10 Lecture Hours)

Ethical Frameworks for Cybersecurity: Introduction, Principlism, Human Rights, From Principlism and Human Rights to the Ethics of Risk, Cybersecurity and the Ethics of Risk, Contextual Integrity.

Ethical and Unethical Hacking: Introduction, Hacker, towards a More Systematic Hackers' Classification, Is 'Ethical Hacking' Ethical? Tensions Between Cybersecurity and Data Protection, Recommended Realignment and Solution Approaches.

UNIT 3: (~9 Lecture Hours)

Cybersecurity of Critical Infrastructure: Introduction, Review of Cybersecurity in the National Security Domain, Cybersecurity of Critical Infrastructure, Case Studies of Cybersecurity in the National Security Domain.

Cybersecurity and the State: Cybersecurity Strategies at the European Union Level, Cybersecurity Strategies at the National Level, The EU Data Protection Framework Addressing Cybersecurity, Tensions Between Cybersecurity and Data Protection, Recommended Realignment and Solution Approaches.

UNIT 4: (~8 Lecture Hours)

Cyber Peace and How It Can Be Achieved: Cyber Conflicts of Today, Cyber Peace, Security and Resilience, Trust and Confidence, Roles and Responsibilities.

Privacy-Preserving Technologies: Introduction, Identity, Authentication and Anonymity, Private Communications, Privacy-Preserving Computations, Privacy in Databases, Discrimination Prevention in Data Mining.

UNIT 5: (~8 Lecture Hours)

Introduction to the Legal Perspectives of Cybercrimes and Cyber security, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime

Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

Text Books:

1. Markus Christen, Bert Gordijn,MicheleLoi Editors, The Ethics of Cybersecurity ,Springer open.
2. SunitBelapure and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India Pvt. Ltd, 2011.

Reference Books:

1. Mark F Grady, FransescoParisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006.
2. Jonathan Rosenoer, "Cyber Law: The law of the Internet", Springer-Verla.

Online Resources:

1. https://www.nationalcyberwatch.org/programs-resources/curriculum/technical-course/ncc-235-cybersecurity-law-and-ethics/
2. https://blog.ipleaders.in/cyber-law-ethics-india/
3. https://www.coursera.org/lecture/business-of-cybersecurity-capstone/an-introduction-to-law-ethics-and-compliance-I1zfK
4. https://blog.netwrix.com/2019/03/26/the-cia-triad-and-its-real-world-application/

Course Outcomes:

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

1. Understand the foundations of Cyber Security and Ethical Hacking.
2. Examine the concepts of cyber law, cyber-crimes, and domain theft.
3. Apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Identify constitutional & organizational laws that affect the information technology professional.
5. Evaluate and Secure corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage.

I Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **2 0 0 -**

ENGLISH FOR RESEARCH PAPER WRITING

(Audit Course-1)

Prerequisites: -Nil-

Course Objectives:

1. To understand the nuances of language and vocabulary in writing a Research Paper.
2. To develop the content, structure and format of writing a research paper.
3. To give the practice of writing a Research Paper.
4. To enable the students to evolve original research papers without subjected to plagiarism.

UNIT 1: (~7 Lecture Hours**)**

Academic Writing:

What is Research? - Meaning & Definition of a research paper – Purpose of a research paper – Scope – Benefits – Limitations – outcomes.

UNIT 2: (~ 7 Lecture Hours**)**

Research Format:

Title – Abstract – Introduction – Discussion – Findings – Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT 3: (~ 6 Lecture Hours**)**

Research Methodology:

Methods (Qualitative – Quantitative) – Literature Review – Who did what – Criticizing, Paraphrasing & Plagiarism.

UNIT 4: (~ 6 Lecture Hours**)**

Process of Writing a research paper:

Choosing a topic – Thesis Statement – Outline – Organizing notes – Language of Research – Word order, Paragraphs – Writing first draft –Revising/Editing- Typing the final draft.

UNIT 5: (~ 6 Lecture Hours**)**

How to & where to get published:

Reputed Journals – National/International – ISSN No, No. of volumes, Scopes Index/UGC Journals – Free publications - Paid Journal publications – /Advantages/Benefits.

Reference Books:

1. MLA Hand book for writers of Research Papers, East West Press Pvt.
2. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers. 4_{th} Edition.

3. Lauri Rozakis, Schaum's Quick Guide to Writing Great Research Papers, Tata McGraw Hills Pvt. Ltd, New Delhi.
4. N. Gurumani, Scientific Thesis Writing and Paper Presentation, MJP Publishers

Online Resources:

1. NPTEL: https://onlinecourses.nptel.ac.in/noc18_mg13/preview

Course Outcomes:

After completion of the course, students will be able to

1. Understand the nuances of research writing.
2. Write a research paper with required writing skills and be confident to share their writing with others.
3. Publish a paper using the requisite standard in a journal.
4. Review the research papers and articles in a scientific manner.
5. Work on citations and ably place them in her research paper.
6. Avoid plagiarism with an ability to develop her own writing skills in presenting the research work.

I Year M.Tech. CNIS I - Semester **L T P C**
Course Code: **2 0 0 -**

DISASTER MANAGEMENT

(Audit Course-1)

Prerequisites: Awareness about Various Planetary & Extra Planetary Hazards, their Impacts & Mitigation measures.

Course Objectives:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.
5. Students will get the overview on the roles of government and non- government agencies in disaster management.
6. Describe the basic concepts of the emergency management cycle (mitigation, preparedness, response and recovery) and their application on various types of disasters.

UNIT 1: (~8 lecture hours**)**
Introduction and Repercussions of Disasters and Hazards: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT 2: (~5 Lecture Hours**)**
Disaster Prone Areas in India Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with special reference to Tsunami; Post-Disaster Diseases and Epidemics.

UNIT 3: (~5 Lecture Hours**)**
Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and Community Preparedness. Disaster Management Cycle.

UNIT 4: (~5 Lecture Hours**)**
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, People's Participation Risk Assessment, Strategies for Survival, Case Studies of Global, National and Local disasters, Techniques of Risk reduction for different disasters.

UNIT 5: (~5 Lecture Hours**)**
Disaster Risk Reduction &Mitigation: Meaning, Environment Security, Climate Change & Security risks,

Climate Security Mechanism, Environmental Cooperation and Peace Building, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation - Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India. Role of NDMA in Disaster Mitigation in India.

Text Books:

1. R. Nishith, Singh A.K,. "Disaster Management in India: Perspectives, Issues and Strategies "'New Royal Book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L, Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

Reference Books:

1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012).
2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
3. Satapathy S. (2009) Psychosocial care in Disaster management, A Training of Trainers Manual (ToT), NIDM Publication.
4. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth. Belg;56:395-401
5. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.
6. UNEP.org- ECO - DRR

Online Resources:

1. https://www.mooc-list.com/tags/earthquake
2. https://freevideolectures.com/course/3581/earthquakes-in-your-backyard
3. https://summer.uci.edu/online/
4. http://www.open.edu/openlearn/free-courses/full-catalogue
5. https://www.edx.org
6. https://www.disasterready.org/courses
7. https://www.unep.org/explore-topics/disasters-conflicts/what-we do/disaster-risk-reduction/ecosystem-based-disaster-risk

Course Outcomes:

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

1. Acquire the knowledge of different disasters and measures to reduce the risk due to these disasters.
2. Plan institutional framework for disaster management at national as well as global levels.
3. Analyze, evaluate and manage the different public health aspects of disaster events at local and global levels, even when limited information is available.
4. Develop capacity to describe, the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
5. Acquire the knowledge on emergency/disaster management cycle for various types of disasters.
6. Develop a basic understanding of prevention, mitigation, preparedness, response and recovery on various types of disasters.

I Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **2 0 0 -**

PEDAGOGY STUDIES

(Audit Course-1)

Prerequisites: -Nil-

Course Objectives:

1. To understand the programme design and policies of pedagogy studies.
2. To develop knowledge, abilities and dispositions with regard to teaching techniques, curriculum design and assessment practices.
3. Analyze various theories of learning and their connection to teaching practice.
4. To familiarize the student with various research designs and research methods.
5. To create an awareness about the practices followed by DFID, other agencies and other researchers.
6. To identify critical evidence gaps to guide the development.

UNIT 1: (~ 8 Lecture Hours)

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 2: (~ 6 Lecture Hours)

Thematic overview: Pedagogical practices followed by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT 3: (~ 6 Lecture Hours)

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 material 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 4: (~ 6 Lecture Hours)

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

UNIT 5: (~ 6 Lecture Hours)

Research gaps and future directions - Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

Reference Books:

1. Ackers J, Hardman F (2001) Classroom Interaction in Kenyan Primary Schools, Compare, 31 (2): 245 – 261.
2. Agarwal 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? Multisite 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 R J (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' campaign.
7. www.pratham.org/images/resources%20working%20paper%202.pdf.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ge03/preview

Course Outcomes:

After learning the contents of this course, the students will be able to:

1. The pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
2. Examine the effectiveness of pedagogical practices.
3. Understand the concept, characteristics and types of educational research and perspectives of research.
4. Importance of the role of teacher education, school curriculum and guidance materials for effective pedagogy.
5. Identify the critical evidence gaps in teaching – learning and to develop strategic plan to fill the gaps.
6. Develop appropriate resources in alignment with the curriculum and its objectives.

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I Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **2 0 0 -**

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(Audit Course-1)

Prerequisites: -Nil-

Course Objectives:

1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom in students.

UNIT 1: (~6 Lecture Hours)

Neetisatakam – Holistic development of personality - Verses 19, 20, 21, 22 (Wisdom) - Verses 29, 31, 32 (Pride and Heroism) - Verses 26,28,63,65 (Virtue)

UNIT 2: (~ 6 Lecture Hours)

Neetisatakam – Holistic development of personality (cont'd) - Verses 52, 53, 59 (dont's) - Verses 71,73,75 & 78 (do's) - Approach to day to day works and duties.

UNIT 3: (~ 7 Lecture Hours)

Introduction to Bhagavadgeetha for Personality Development - Shrimad BhagawadGeeta: 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 4: (~ 7 Lecture Hours)

Statements of basic knowledge - Shrimad BhagawadGeeta: Chapter 2-Verses 56, 62,68 - Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad BhagawatGeeta.

UNIT 5: (~6 Lecture Hours)

Role of Bahgavadgeeta in the present scenario - Chapter 2 – Verses 17 - Chapter 3 – Verses 36, 37, 42 - Chapter 4 – Verses 18, 38, 39 - Chapter 18 – Verses 37, 38, 63.

Reference Books:

1. Srimad Bhagavad Gita by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
2. Bhartrihari'sThriSatakam (Niti – Sringar- Vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Online Courses:

1. NTPEL: http://nptel.ac.in/downloads/109104115/

Course Outcomes:

After learning the contents of this course, the students will be able to:

1. Develop their personality and achieve their highest goal of life.
2. Lead the nation and mankind to peace and prosperity.
3. Develop versatile personality.
4. Harmonize peace and mental well-being to handle day-to-day works more productively.
5. Understand oneself for holistic development.
6. Explore one's own potential to enhance their productive work.

I Year M.Tech. CNIS II-Semester **L T P C**
Course Code: **2 0 0 -**

SANSKRIT FOR TECHNICAL KNOWLEDGE

(Audit Course-2)

Prerequisites: -Nil-

Course Objectives:

1. To get a working knowledge in Illustrious SANSKRIT, the scientific language in the world.
2. To improve brain functioning.
3. To enhance the memory power to develop logic in Mathematics, Science and other subjects.
4. To explore the huge treasure of knowledge that is hidden in the ancient literature.

UNIT 1: (~ 6 Lecture Hours**)**

Alphabets in SANSKRIT

Varnamala – Vowels (Swaraaha) and consonants (Vyanjanaani) – samyuktavarnaaha (compound letters) – Varna vishleshanam (Disjoining of letters) – Varna samshleshanam (Joining of letters) - Practise of simple words – Three genders – Pumlingam (Masculine Gender) – Streelingam (Feminine Gender) – Napumsaka lingam (Neutral Gender) – The forms of Nouns – Singular & Plural.

UNIT 2: (~6 Lecture Hours**)**

Pronouns & Demonstrative pronouns (Sarvanaamashabdaaha) Eshaha, Yeshaa&Yetat –Question words – Five Ws& one H (Kim, kadaa, kutra, Kaha, Kimartham&Katham) Different forms of verbs – Tenses – Present – Past & Future Tenses.

UNIT 3: (~6 Lecture Hours**)**

Propositions (Vibhaktis) – Prathama – Dwitiya – Truteeya – Chaturthee – Panchami – Shashtee – Saptami – Sambodhana Prathama The Three Purushas – Prathama (RamahaRaamouRaamaaha) – Madhyama (twamYuvaamYooyam) – Uttama (AhamAawaamVayam).

UNIT 4: (~ 6 Lecture Hours**)**

Order (Subject – Verb – Object) karta – Kriya - karma

Introduction of Roots – Ancient literature on Science & Technology in SANSKRIT language - Scope of SANSKRIT in India – Technical information about SANSKRIT Literature. - Technical concepts of Engineering.

UNIT 5: (~6 Lecture Hours**)**

Technical concepts of Engineering – Electrical, Mechanical, Architecture and Mathematics - Role of SANSKRIT in the field of Science & Technology. Scope of SANSKRIT as a powerful & alternative tool in the field of Computer Science.

Suggested Reading:

1. "ABHYAAS PUSTAKAM", Dr.Vishwas, Samskrutha Bharati Publications, New Delhi.
2. Teach Yourself SANSKRIT, Prathama Deeksha by Vempati Kutumba Shastri, Rashtriya Sanskrit Sansthan, New Delhi Publications.
3. "India's glorious Scientific Tradition", Suresh Soni, Ocean Books Pvt. Ltd., NewDelhi.

Course Outcomes:

After learning the contents of this course, the students will be able to:

1. Gain knowledge in basic SANSKRIT language.
2. Understand the ancient SANSKRIT literature about Science & Technology.
3. Develop logical and analytical skills.
4. Relate the relevance of Sanskrit to Science and Technology.
5. Appreciate the conceptual understanding of Sanskrit to develop one's own competencies to understand, analyze and apply to sciences.
6. Identifying the similarities and differences to develop linguistic competency in learning a new language

I Year M.Tech. CNIS II-Semester **L T P C**
Course Code: **2 0 0 -**

VALUE EDUCATION

(Audit Course-2)

Prerequisites: -Nil-

Course Objectives:

1. Understand value of Education and self-development.
2. Imbibe good values in students.
3. Know the importance of character.

UNIT 1: (~ 7 Lecture Hours**)**

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 - Importance of cultivation of values.

UNIT 2: (~ 6 Lecture Hours**)**

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

UNIT 3: (~ 6 Lecture Hours**)**

Personality and Behaviour Development – Soul and Scientific attitude. Positive thinking. Integrity and Discipline - Punctuality, Love and Kindness - Avoid Fault Thinking - Free from anger, Dignity of labour.

UNIT 4: (~ 6 Lecture Hours**)**

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 5: (~ 6 Lecture Hours**)**

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 Books:

1. Chakroborty, SK. 'Values and Ethics for Organizations – Theory and Practise', - Oxford University Press, NewDelhi.

Online Resources:

1. http://nptel.ac.in/courses/109104068/36
2. http://nptel.ac.in/courses/109104068/37

Course Outcomes:

After learning the contents of this course, the students will be able to:

1. Gain knowledge on self-development.
2. Learn the importance of Human Values.
3. Develop overall personality.
4. Understand the importance of value education to build tolerance and harmony at different layers.
5. Identify the ways for self-development.
6. Identify the basic values and principles to guide one's own life.

I Year M.Tech. CNIS II-Semester **L T P C**
Course Code: **2 0 0 -**

CONSTITUTION OF INDIA

(Audit Course-2)

Prerequisites: -Nil-

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT 1: (~8 Lecture Hours**)**

History of making of the Indian Constitution & Philosophy of the Indian Constitution History of making of the Indian Constitution:History, Drafting Committee (Composition & Working)

Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT 2: (~6 Lecture Hours**)**

Contours of Constitutional Rights and 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 3: (~6 Lecture Hours**)**

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 4: (~6 Lecture Hours**)**

Local Administration:

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

UNIT 5: (~6 Lecture Hours**)**

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 Books:

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 Edition, Lexis Nexis, 2014.

Online Resources:

1. https://nptel.ac.in/courses/129106003 [Constitutional Studies by Prof. Sudhir Krishna Swami, IIT Madras]
2. https://onlinecourses.swayam2.ac.in/cec20_hs38/preview [Indian Government and Politics by Dr.Aijaz Ashraf Wani, University of Kashmir, Srinagar]

Course Outcomes:

After learning the contents of this course, the students will be able to

1. Tell about function of Indian constitution with clarity and understanding.
2. Identify the Rights of equality, the Right of freedom and the Right to constitutional remedies.
3. Mark the knowledge of union government & their powers and function.
4. Define the state and central policies, fundamental duties.
5. Explain the powers and functions of Municipalities, Panchayats and Co-operative Societies.
6. Discuss the Electoral Process, special provisions.

I Year M.Tech. CNIS II-Semester **L T P C**
Course Code: **2 0 0 -**

STRESS MANAGEMENT BY YOGA

(Audit Course-2)

Prerequisites: -Nil-

Course Objectives:

1. Creating awareness about different types of Stress and role of Yoga in the management of Stress.
2. Promotion of positive health and overall wellbeing (Physical, mental, emotional, social and spiritual).
3. Prevention of stress related health problems by Yoga practice.

UNIT 1: (~ 4 Lecture Hours**)**

- Meaning and definition of Yoga
- Historical perspective of Yoga
- Principles of Astanga Yoga by Patanjali.

UNIT 2: (~ 4 Lecture Hours**)**

- Meaning and definition of Stress.
- Types of Stress-Eustress and Distress.
- Anticipatory Anxiety and Intense Anxiety and depression.
- Meaning of Management- Stress Management.

UNIT 3: (~ 8 Lecture Hours**)**

- Concept of Stress according to Yoga
- Stress assessment methods
- Role of Asana, Pranayama and Meditation in the management of stress.

UNIT 4: (~ 8 Lecture Hours**)**

Asanas:: (5 Asanas in ach posture)

- Warm up
- Standing Asanas
- Sitting Asanas
- Prone Asanas
- Supine asanas
- Surya Namaskar

UNIT 5: (~ 8 Lecture Hours**)**

Pranayama:

- Anulom and Vilom Pranayama
- Nadishudhi Pranayama
- Kapalabhati Pranayama
- Bhramari Pranayama
- Nadanusandhana Pranayama.

Meditation techniques:

- Om Meditation
- Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT)

Suggested Reading:

1. Andrews, Linda Washer (2005) Stress control for peace of mind, London: Greenwich Editions.
2. Author's Guide -Yoga- The science of Holistic Living, Chennai: The Vivekananda Kendra Prakashan trust.
3. Iyengar BKS (2003) The art of Yoga, New Delhi: Harper Collins Publishers.
4. Lalvani, Vimla ((1998) Yoga for Stress, London: Hamlyn.
5. Maguire, Imelda 92005)Yoga for a healthy body, London: Greenwich editions.
6. Nagendra H.R. and Nagaratna.R 92004) Yoga prespective in stress management, Bangalore: Swami Vivekananda Yoga prakashan.
7. Nagendra H.R. and Nagaratna.R 92004) Yoga practices for Anxiety and Depression, Bangalore: Swami Sukhabhogananda Yoga prakashan.
8. Sukhabhogananda, Swami (2002) Stress management, Bangalore: Prakashan trust.
9. Udupa (1998) Stress management by Yoga , New Delhi: MotilalBandaridas Publishers pvt. Ltd.
10. Ravi Shankar N.S. (2001) Yoga for Health, New Delhi: Pustak Mahal.

Reference Books:

1. Chakroborty, SK. 'Values and Ethics for Organizations – Theory and Practise', - Oxford University Press, NewDelhi.

Course Outcomes:

After learning the contents of this course, the students will be able to

1. Enhancement of Physical strength and flexibility.
2. Learn to relax and focus.
3. Relieves physical and mental tension.
4. Improved work performance/ efficiency.
5. Integrate Yoga into one's lifestyle.
6. Learn to practice the basic concepts of yoga to manage stress.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code: **3 0 0 3**

BUSINESS ANALYTICS

(Open Elective)

Prerequisites: -Nil-

Course Objectives:

1. To understand the role of business analytics within an organization.
2. To gain and understanding in usage of business analytics in formulating and solving problems using analytical and management tools in managerial decision making.
3. To Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization and across various sectors.

UNIT 1: (~8 Lecture Hours**)**

Introduction to Business Analytics

Introduction to Analytics - Importance of Analytics in Problem analytics - Business Analytics - Importance - Difference between Business Analytics and Business Intelligence - Evolution of Business Analytics - Types of Business Analytics - Characteristics - Goals - Domains of Business Analytics - Framework of Business Analytics - Analytics Ecosystem - Process - advantages - steps of Decision modeling for Business Analytics.

UNIT 2: (~9 Lecture Hours**)**

Organization Structure and Data for Business Analytics

Organization Structure of Business Analytics - Functional organization - Matrix - centralized structure with Business Analytics - Factors determining in choosing appropriate structure - Reasons for organizational failure for Business Analytics Initiatives - Team Management - Reasons for Team failure.

Data - Characteristic of Readiness of data Dimensions - Data taxonomy - Data mining - Process - Implications of Data outlines - Steps in data driven decision making - Importance of sampling - Data visualization –Types of Data Storytelling - Data Journalism - Data warehousing.

UNIT 3: (~10 Lecture Hours**)**

Descriptive Analytics

Introduction to Descriptive Analytics, Measure of Central Tendency-Mean, Median, Mode Measure of Variation-Variance, Standard deviation, Mean Deviation, Interquartile Deviation Measure of Shape-Kurtosis, Skewness, Measure of Association-Covariance, Correlation.

Random Variables: Discrete probability Distribution and Continuous Probability Distribution (Mean, Median, Mode).

UNIT 4: (~10 Lecture Hours**)**

Predictive and Prescriptive Analytics

Predictive Analytics– Regression- Simple linear regression, Multiple linear regression-Test of significance of regression coefficients Using ANOVA (one way and twoway classification), Coefficient of Determination. Forecasting -Time Series Analysis- Trend Analysis, Moving Average Method, ARMA Model with error Analysis.

Prescriptive Analytics: Linear Programing Problem- Graphical Method, Simplex Method.

UNIT 5: (~8 Lecture Hours**)**

Decision Analysis

Problem Formulation, Decision analysis without probabilities, Decision analysis with probabilities, Decision Analysis with sample information, Computing Branch Probabilities with Bayes Theorem, Utility Theory.

Text Books:

1. Ramesh Sharada, DursunDelen, Efraim Turban and David King: Business Intelligence, Analytics, and Data Science - A Managerial Perspective:Pearson: 4th Edition.
2. U Dinesh Kumar: Business Analytics - The Science of Data-Driven Decision Making: Wiley, 2nd Edition.

Reference Books:

1. Gert H.N. Laursen andJesperThorlund: Business Analytics for Managers - Taking Business Intelligence Beyond Reporting: Wiley 2nd Edition.
2. Camm, Cochran, Fry, Ohlmann, anderson, Sweeney andWilliams: Essentials of Business Analytics: Cengage Publishers

Online Resources:

1. NPTEL: Business Analytics for Management Decision http://nptel.ac.in/courses/110105089/

Course Outcomes:

After completion of the course, students will be able to

1. Understand and apply business analytics in real time world.
2. Comprehend the structure of an organization for business analytics implementation.
3. Identify the befitting descriptive tool required for the business problem.
4. Apply suitable predicative method that supports business decision making.
5. Identify appropriate prescriptive modeling techniques for decision making.
6. Translate data into clear, actionable insights in the decision-making process.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code: **3 0 0 3**

INDUSTRIAL SAFETY

(Open Elective)

Prerequisites: Industrial Management.

Course Objectives:

The purpose of this course is to teach the students.

1. Concepts of industrial safety and provide useful knowledge for work place safety.
2. Understand Industrial Safety Programs, Fire explosions and its Preventive methods.
3. Helps in identification, evaluation and control of the hazards.
4. Mitigate harm to people, property and the environment.
5. Quality maintenance process, Duties & Responsibilities of Safety officer's.
6. Overhauling of Mechanical & Electrical machinery components, difference between Periodic & Preventive Maintenance.

UNIT 1: (~10 Lecture Hours**)**

Industrial Safety: Importance and objectives of safety, safety programs – components and realisation. Evolution of modern safety concept, safety policy, safety organisation. Implementation of safety procedures.

UNIT 2: (~ 10 Lecture Hours**)**

Accidents: causes, types, results and control, mechanical and electrical hazards types, causes and preventive steps, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water, lights, cleanliness fire guarding etc. safety colour code, fire prevention and fire fightingequipments and methods.

UNIT3: (~10 Lecture Hours**)**

Fundamentals of maintenance engineering: Definition of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, types of maintenance, maintenance cost and its relations with replacement economy, service life of equipment.

UNIT 4: (~8 Lecture Hours**)**

Quality and safety in maintenance: needs for quality maintenance process, maintenance work quality, use of quality control, post maintenance testing, reasons for safety problems in maintenance, guidelines to safety in maintenance work, safety officers' role in maintenance work, Protection of maintenance workers.

UNIT 5: (~10 Lecture Hours**)**

Types of maintenance: corrective, breakdown, predictive, replacement, preventive and proactive maintenance.

Periodic and preventive maintenance in details: Periodic maintenance: inspection- concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motors, common troubles and remedies of electric motor, repair complexities and its use

Preventive maintenance: definition, needs, steps and advantages.

Text Boks:

1. Krishnan N.N., Safety management in industries, Jaico publishing house, Bombay, 1997.
2. H.P. Garg, S., Maintenance Engineering, S. Chand and company.

Reference Books:

1. Handley,W. Industrial safety Hand book, 2nd Edn, McGraw-Hill Book Company, 1969
2. Higgins & Morrow, Maintenance Engineering Handbook, Da Information Services.
3. Mc Cornick, E.J., Human Factors in Engineering and design, Tata McGraw-Hill, 1982

Online Resources:

1. https://www.spplimited.co.in/industrial-safety-certificate-course-training-in-chennai/
2. https://onlinecourses.nptel.ac.in/noc18_mg42/preview

Course Outcomes:

Students after completing this course would be able to.

1. Know the need for safety in industries
2. Know about factory acts and industrial safety regulations
3. Analyse causes and types of different hazards on their preventions.
4. Assess quality maintenance processes and maintenance work quality.
5. Assess safety practices and programs.
6. Know about periodic and preventive maintenance activities inindustries.

II Year M.Tech. CNIS - I Sem **L T P C**
Course Code: **3 0 0 3**

OPERATIONS RESEARCH

(Open Elective)

Prerequisites: -Nil-

Course objectives:

The course will enable the students to:

1. Study the linear programming and nonlinear programming techniques used for business and engineering applications.
2. Understand the importance of dynamic programming concept in operations research
3. Know about the inventory, Game theory and waiting line model applications in real world.

UNIT 1: (~ 10 Lecture Hours**)**

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem-Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M methods, Special cases in LP-Degeneracy, unbounded, infeasibility & alternative optima.

UNIT 2: (~10 Lecture Hours**)**

TransportationProblem:Formulation,solution, unbalanced Transportation problem. Finding basic feasible solutions-Northwest corner rule, least cost method and Vogel's approximation method. Optimality test by MODI method & stepping stone method.

Assignment problem: Formulation. Hungarian method for optimal solution. Solving unbalanced Assignment problem.

UNIT 3: (~10 Lecture Hours**)**

a) **Dynamic programming**. Characteristics of dynamic programming. Dynamic programming approach for Coach/ Shortest Path and cargo loading problems.

b) **Inventory models**. Inventory costs. Models with deterministic demand-model (a) demand rate uniform and production rate infinite, model (b) demand rate uniform and production rate finite.

UNIT 4: (~10 Lecture Hours**)**

a) **Games Theory**. Competitive games rectangular game saddle point, minimax (maximin) method of optimal strategies, and value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point-mixed strategy for 2*2 games.

b) **Waiting lines:** Single channel –poison arrivals and exponential service times with infinite population and finite population models. Multi-channel- poisson arrivals and exponential service times with infinite population.

UNIT 5: (~ 8 Lecture Hours**)**

Non-linear Programming: Introduction to non-linear programming (NLP), Convex and concave functions, NLP with one variable, Line search algorithms, Multivariable unconstrained problems, constrained problems, Lagrange Multiplier, The Karush-Kuhn-Tucker (KKT) conditions, the method of steepest ascent, convex combination method, penalty function, Quadratic programming.

Text Books:

1. JK Sharma.,Operations Research, theory and applications, 5th edition, Macmillan India Ltd, 2013
2. S S Rao, Engineering optimisation – Theory and Practice, 4th edition, John Wiley & Sons Inc., 2009 .

Reference Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. F.H. Hillier and G.J. Lieberman, Introduction to Operations Research, Tata-McGraw-Hill, 2010
3. S.D. Sharma, Operations Research, Kedarnnath, Ramnath & Co., Meerut, 2009.
4. V.K. Kapoor, Operations Research, S. Chand Publishers, New Delhi, 2004.

Online Resources:

1. IOR Tutorials (Interactive Operations Research Tutorial)
2. onlinecourses.nptel.ac.in

Course Outcomes:

At the end of the course students are expected to

1. Apply linear programming models to several Engineering Applications.
2. Solve selected models in Dynamic Programming practical applications.
3. Apply simple mathematical models in Inventory into the real Engineering Applications.
4. Solve Game theory problems related to business applications,
5. To minimize waiting time of the customer and optimization of number of servers.
6. Able to apply the concept of non-linear programming models to various engineering applications.

II Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **3 0 0 3**

COST MANAGEMENT OF ENGINEERING PROJECTS

(Open Elective)

Prerequisites: -Nil-

Course Objectives:

1. Give inputs in handling the cost associated with engineering projects.
2. Acquaint the practical aspects of cost management.
3. Orient the quantitative techniques applicable to cost management.

UNIT 1: (~8 Lecture Hours**)**

INTRODUCTION TO PROJECT MANAGEMENT

Project- Need of Project Management- Objectives – Scope- Importance of Project Management -Principles of Project Management- Types of Projects-Roles and Responsibilities of Project Team.

UNIT 2: (~ 9 Lecture Hours**)**

PROJECT PLANNING AND IMPLEMENTATION

Project Management Life Cycle-Process-Project Selection – Feasibility study: Types of feasibility - Steps in feasibility study- Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations – Basic Scheduling Concepts - Resource Levelling – Resource Allocation-Execution.

UNIT 3: (~ 8 Lecture Hours**)**

COST MANAGEMENT FOR PROJECTS

Introduction and importance of Cost Management for Projects- Objectives of Costing System -Various cost concepts- Cost Classification on the basis of behaviour (as variable, fixed and semi variable)-Traceability (as direct and indirect)- Functions (as production cost, administration cost, selling cost and distribution cost).

UNIT 4: (~ 10 Lecture Hours**)**

BUDGETARY CONTROL

Introduction to Budget- Concepts, Advantages- Types of Functional budgets: Fixed and Flexible budget, Performance budget, Cash Budget and Production Budget (Simple Problems on Functional based budget). Introduction to Zero based budgeting.

UNIT 5: (~ 10 Lecture Hours**)**

PROJECT-COST MANAGEMENT

Project Cost Estimation- Project Financing- Project Planning and Scheduling-Project Cost Control-Quantitative Techniques for Project Cost Management-Linear Programming-Network Analysis-PERT/CPM-Project Cost Analysis-Transportation Model-Assignment Model (Simple Problems) – Simulation-Learning Curve Theory-Project Methodologies -Types-Project Integrated Management (PIM).

Text Books:

1. K.Nagarajan., Project Management, New Age International Publishers.
2. L.S.Srinath , PERT and CPM Principles and Applications.
3. Charles T. Horngren and George Foster, Cost Accounting: A Managerial Emphasis, PHI, 1st Edition.

Reference Books:

1. Arun Kanda, Project Management A Life Cycle Approach, Prentice Hall of India, 2011
2. R.B.Khanna, Project Management, Prentice Hall of India, 2011
3. R.Panneerselvam and P.Senthilkumar, Project Management, Prentice Hall of India, 2009
4. Blocher, Chen, Cokins, and Lin, Cost Management: A Strategic Emphasis.
5. John K. Shank and Vijay Govindarajan, Strategic Cost Management.

Online Resources:

1. http://nptel.ac.in/courses/110101004/24

Course Outcomes:

After completion of the course, students will be able to

1. Perceive the cost associated in managing engineering projects
2. Develop Project Planning proposal considering time and cost
3. Furnish effective cost management practices for better handling of engineering projects
4. Prepare budgets for engineering projects.
5. Propose the Quantitative Techniques for Project Cost Management.
6. Orient the cost management decision-making using quantitative methodology in minimizing the cost associated with the projects.

II Year M.Tech.CNISI-Semester **L T P C**
Course Code: **3 0 0 3**

COMPOSITE MATERIALS

(Open Elective)

Prerequisites: -Nil-

Course Objectives:

1. Learn to demonstrate a critical understanding of composite materials of their nature and application.
2. Critically evaluate the types of reinforcements and their advantages in application.
3. Develop an understanding of different types of metal matrix composites and their preparation.
4. Develop an understanding of different types of ceramic matrix composites and their preparation.
5. Develop an understanding of different types of polymer matrix composites and their preparation.
6. Critically evaluate strength of the composite materials through laminar study.

UNIT 1: (~9 Lecture Hours**)**

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 2: (~9 Lecture Hours**)**

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 Behaviour of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT 3: (~9 Lecture Hours**)**

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 4: (~8 Lecture Hours**)**

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 5: (~ 9 Lecture Hours**)**

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygro-thermal 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. R.W.Cahn – VCH, Material Science and Technology – Vol 13 – Composites, West Germany.
2. R. Balasubramaniam, Callister's Materials Science and Engineering, An introduction, John Wiley & Sons, NY, Indian Edition, 2007.

Reference Books:

1. ed-Lubin, Hand Book of Composite Materials.
2. K.K.Chawla, Composite Materials.
3. Deborah D.L. Chung, Composite Materials Science and Applications.
4. Danial Gay, Suong V. Hoa, and Stephen W, Composite Materials Design and Applications.

Online Resources:

1. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/ Composite%20Materials/pdf/Lecture_Notes/LNm1.pdf
2. https://www.asminternational.org/documents/10192/1849770/05287G_Sample_Chapter.pdf
3. http://home.iitk.ac.in/~mohite/Composite_introduction.pdf
4. https://onlinecourses.nptel.ac.in/noc18_me03/preview
5. https://www.online.colostate.edu/courses/MECH/MECH530.dot

Course Outcomes:

After completion of the course students will be able to:

1. Differentiate composite materials and their applications.
2. Analyse, evaluate and manage the different the types of reinforcements.
3. Develop different types of metal matrix composites and prepare the same for their specific needs as engineers.
4. Develop different types of ceramic matrix composites and prepare the same for their specific needs as engineers.
5. Develop different types of polymer matrix composites and prepare the same for their specific needs as engineers.
6. Critically enhance strength of the composite materials through Laminar usage.

II Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **3 0 0 3**

ENERGY FROM WASTE

(Open Elective)

Prerequisites: -Nil-

Course Objectives:

1. To classify various waste resources.
2. To identify various methods of waste disposal.
3. To study various energy generation methods from waste.
4. To analyze various processes of recycling of waste and environmental benefits.

UNIT 1: (~8Lecture Hours**)**

Classification of waste – Agro based, Domestic, Bio-Medical, Forest residue, Industrial waste, recycling of waste, Segregation of waste, waste treatment, Environmental impacts. Land fill method for disposal of waste, Land fill classification.

Guidelines for Minimization of Wastage in Society (Individual houses, Apartments, Industries etc.)-Reduce, Reuse & Recycle. Minimization of all types of wastage through Orientation programs, Awareness camps, workshops, seminar etc.

Group Discussion Activity(~ 2 Lecture Hours**)**

UNIT 2: (~9 Lecture Hours**)**

Biomass: Pyrolysis – Byproducts of Pyrolysis– Manufacture of pyrolytic oils and gases, applications. Biomass Gasification: Gasifiers – Fixed bed system –Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation Concepts of Gasifier Arrangements, Burner and Engine arrangements for electric power generation.

UNIT 3: (~8Lecture Hours**)**

Biomass Combustion: Biomass stoves – Improved challahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT 4: (~8Lecture Hours**)**

Biogas: Properties of biogas (Calorific value and composition), Biomass resources and their classification - Biomass conversion processes.

Types of biogas Plants, Applications, Alcohol production from biomass- Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

UNIT 5: (~7 Lecture Hours**)**

E-waste: e-waste in the global context- Environmental concerns and health hazards Recycling e-waste, Global trade in hazardous waste, e-waste legislation, Government regulations on e-waste management.

NOTE:A classroom activity such as Group Discussion involving all students to be conducted on the topics given in the second half of first unit.

Text Books:

1. Desai, Ashok V.,"Non-Conventional Energy" Wiley Eastern Ltd., 1990.
2. Challal, D.S., " Food, Feed and Fuel from Biomass" IBH Publishing Co.Pvt.Ltd.,1991.
3. Nicholas P. Cheremisinoff." Handbook of Solid Waste Management and Waste Minimization Technologies" An Imprint of Elsevier, New Delhi, 2003.
4. T.V. Ramachandra, Management of Municipal Solid Waste, The Energy and Resources Institute, TERI, 2009.

Reference Books:

1. C.Y.WereKo-Brobby and E.B.Hagan, "Biomass Conversion and Technology"John Wiley & Sons,1996.
2. M.Dutta,B.P.Parida,B.K.Guha and T.R.Surkrishnan"Industrial Solid Waste Management and Landfilling practice."Narosa Publishing House, New Delhi, 1999.
3. Khandelwal, K.C. and Mahdi S.S. "Biogas Technology-A Practical Hand BookVol.I& II," Tata McGraw Hill Publishing Co.Ltd.' 1983.

Online Resources:

1. https://nptel.ac.in/courses/103107125

Course Outcomes:

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

1. Understand the methods of recycling of waste.
2. Compare the methods of waste disposal.
3. Identify different sources of energy from waste.
4. Analyze methods for management of waste.
5. Understand the global trade in hazardous waste.
6. Understand and adapt Waste minimization techniques as a societal responsibility.

II Year M.Tech. CNIS I-Semester **L T P C**
Course Code: **3 0 0 3**

POWER FROM RENEWABLE ENERGY SOURCES

(Open Elective)

Prerequisites: -Nil-

Course Objectives:

1. To introduce various types of renewable energy technologies.
2. To understand the technologies of energy conversion from the resources and their quantitative analysis.

UNIT 1: (~10 Lecture Hours**)**

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's Surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors- concentrated collectors- construction and thermal analysis- Solar applications- Solar ponds- Heliostat systems-water heater-air heater-solar still

UNIT 2: (~8 Lecture Hours**)**

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics- Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking - Solar Thermo electric conversion.

UNIT 3: (~8 Lecture Hours**)**

Wind Energy- Fundamentals of wind energy-power available in wind- Betz Limit Aerodynamics of wind turbine-Wind turbines- Horizontal and vertical axis turbines –their configurations- Wind Energy conversion systems.

UNIT 4: (~9 Lecture Hours**)**

Energy from Bio Mass- Various fuels- Sources-Conversion technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion - Factors affecting generation of bio gas - Classification of bio gas plants-Different Indian digesters- Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy – sources- Hydrothermal convective – Geo-pressure resources - Petro-thermal systems (HDR) - Magma Resources-Prime Movers.

UNIT 5: (~ 9 Lecture Hours**)**

Ocean Thermal Energy Conversion Systems- Principle of operation - Open and closed cycles, Energy from Tides - Principle of Tidal Power - Components of tidal Power plants - Operation Methods - Estimation of Energy in Single and double basin systems - Energy and Power from Waves Wave energy conversion devices - Fuel Cells - Design and Principle of operation - Types of Fuel Cells - Types of Electrodes – Applications - Basics of Batteries - Constructional details of Lead acid batteries - Ni-Cd Batteries.

Text Books:

1. "John Twidell&Wier", "Renewable Energy Resources", CRC Press, 2009.
2. "G. D. Rai", "Non Conventional Energy sources", Khanna publishers, 2004.

Reference Books:

1. "D. P.Kothari, Singal, Rakesh and Ranjan", "Renewable Energy sources and Emerging Technologies", PHI, 2009.
2. "F. C. Treble", Generating Electricity from Sun, Pergamon Press, 1st Edition 1991.
3. "C. S. Solanki", "Solar Photovoltaics – Fundamentals- Principles and Applications", PHI, 2009.
4. "S. P. Sukhatme", "Solar Energy Principles and Application", TMH, 2009.

Online Resources:

1. https://nptel.ac.in/courses/103103206

Course Outcomes:

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

1. Analyse solar thermal and photovoltaic systems and related technologies for energy conversion.
2. Understand Wind energy conversion and devices available for it.
3. Understand Biomass conversion technologies, Geo thermal resources and energy conversion principles and technologies.
4. Realize Power from oceans (thermal, wave, tidal) and conversion devices.
5. Understand fundamentals of fuel cells and commercial batteries.
6. Suggest suitable methods of power generation for a particular region/ organization based on the availability of resources.

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PROGRAM EDUCATIONAL OBJECTIVES

PEO-1:	Providing students with a compelling foundation in Engineering and Basic Sciences that will further help them conduct investigations of complex problems.
PEO-2:	Applying scientific and Engineering methodologies using modern tools and techniques in the analysis, design, implementation and evaluation of information in the field of IT.
PEO-3:	Promoting lifelong learning and help students in aiming for higher education and become successful Engineers in the society.
PEO-4:	Inculcating strong communication skills, ethics and various codes of professional practices useful in performing effective project management & team collaborations and enable them to sustain and excel in various environments.

PROGRAM OUTCOMES – M.TECH (CNIS)

PO1	An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery in the areas of Computer Networks & Information Security as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate Bachelor program.
PO4	Empower students with Sustainable and Inclusive Technologies for improving their knowledge and competence.
PO5	An Ability to develop necessary skills and Professional ethics for their career advancement and engage in Life Long learning.

G.NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE (For Women)
(AUTONOMOUS)

INSTITUTE VISION

To become a center of quality education in Engineering and Technology for women empowerment.

INSTITUTE MISSION

- To fulfill the academic aspirations of women engineers for enhancing their intellectual capabilities and technical competency.
- To Leverage Leading – Edge Technologies and cultivate exemplary work culture.
- To facilitate success in their desired career in the field of engineering to build a progressive nation.

INSTITUTE QUALITY POLICY

G. Narayanamma Institute of Technology and Science (For Women), Hyderabad is committed in imparting Quality Education and Training for women empowerment in the field of "Engineering and Technology" and to satisfy applicable requirements through continual improvement of the Quality Management System by facilitating and supporting the staff and students to work as a team in upgrading their knowledge and skill in tune with the industrial and technological developments through a set of Quality objectives.