7.1.10: The Institution has a prescribed code of conduct for students, teachers, administrators and other staff and conducts periodic programmes in this regard.

1. The institutional Code of Conduct principles are displayed on the website
2. There is a committee to monitor adherence to the institutional Code of Conduct principles
3. Institution organizes professional ethics programmes for students, teachers, administrators and other staff
4. Annual awareness programmes on Code of Conduct are organized

7.1.10_4: Handbooks, manuals and brochures on human values and professional ethics

The human values and professional ethics is a included in our academic courses. As a part of Curriculum the following subjects are there in our Research Policy and Curriculum. The detailed syllabus available in the Hand Book attached below.

Sl.No	Course Code	Course Name
1.	SCC5161ES	Research Methodology & IPR
2.	SAD9002CE	Disaster Management
3.	SAD9003HS	Sanskrit for Technical Knowledge
4.	SAD9004HS	Value education
5.	SAD9013HS	Stress Management by Yoga
6.	SAD9014HS	Personality Development through life Enlightenment Skills

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Scheme of Instructions, Examination & Detailed Syllabus

for

Two-Year P.G. Programme of

MASTER OF ENGINEERING (M.E.)

in

EMBEDDED SYSTEMS

(with effect from the academic year 2021-22)

(Approved by College Academic Council on 14th, July 2021)

Empower women-Impact the world

Estd. 2008

Issued by **Dean, Academics**

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

(Affiliated to Osmania University)
(Accredited by NAAC with "A" Grade)
Abids, Hyderabad-500001, Telangana.

Vision of the Institute

Empowering girl students through professional education integrated with values and character to make an impact in the world.

Mission of the Institute

M1: Providing quality engineering education for girl students to make them competent and confident to succeed in professional practice and advanced learning

M2: Establish state-of-art-facilities and resources to facilitate world class education

M3: Integrating qualities like humanity, social values, ethics, leadership in order to encourage contribution to society

Vision of the Department

Empowering girl students with the contemporary knowledge in Electronics and Communication Engineering for their success in life.

Mission of the Department

M1: To impart rationalized and high quality technical education and knowledge.

M2: To achieve self-sustainability and overall development through Research and Consultancy activities.

M3: To provide education for life by focusing on the inculcation of human and moral values through an honest and scientific approach

M4: To groom students with good attitude and personality skills.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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Program Educational Objectives

PEO-1: Graduate shall have skills to excel in professional career and in applied research through innovative design by acquiring the knowledge in Electronics and Communication Engineering principles

PEO-2: Graduate shall pursue higher education and participate in research and development activities or entrepreneurship to integrate engineering work in the environmental, ethical and broader societal contexts.

PEO-3: Graduate shall exhibit effective communication, good team building and leadership qualities to design socially accepted and economically feasible solutions through multidisciplinary and interdisciplinary approaches for analysis of real-life problems.

Program Specific Outcomes

PSO1: **Appertain to Communication and Automation Principles:** To apply principles of Communication Engineering and Signal Processing both in private and public organizations**.**

PSO2: **Adaptability to Productive Environment:** To be well equipped with Management skills, interdisciplinary and modern technologies.

Approved by Chairperson BoS (ECE)

M.E. Embedded Systems

(Full–Time)

Index

Approved by Chairperson BoS (ECE)

RULES AND REGULATIONS OF M.E. PROGRAMME

Rules and Regulations
for
TWO-YEAR POSTGRADUATE PROGRAMMES IN ENGINEERING

M.Tech.(CSE)/M.E.(ES)

(Applicable to the students admitted from the Academic Year 2021-2022 onwards)

PREAMBLE

Stanley College of Engineering and Technology for Women – a temple of learning – with an objective of empower women and impact the world was established in the year 2008 on a sprawling 6-acre campus of historic Stanley campus at Abids, Hyderabad. The college provides a serene and tranquil environment to the students, boosting their mental potential and preparing them in all aspects to face the global challenges. Stanley College of Engineering and Technology for Women has been established with the Executive board of Methodist Church of India that has been gracious and instrumental in making the vision of an Engineering College on this campus, a reality. The college is affiliated to the prestigious Osmania University, Hyderabad. It has been approved by AICTE, New Delhi, recognized by the Government of Telangana. Autonomous status given to the STLW college by the U.G.C and University, which provides greater flexibility towards academic development and for upliftment of academic standards, excellence to prescribe its own courses of study, syllabi, restructure and redesign the course to suit local needs. The College has Accredited by NAAC with 'A' Grade & All eligible Under Graduate (UG) Courses by NBA. It has been sanctioned with six UG-Courses:

- B.E.(Computer Science & Engineering)
- B.E.(Electronics and Communication Engineering)
- B.E.(Electrical and Electronics Engineering)
- B.E.(Information Technology)
- B.E.(Computer Engineering)
- B.E.(Artificial Intelligence and Data Science)

and PG programs

- M.Tech.(Computer Science and Engineering)
- M.E.(Embedded Systems)
- Master of Business Administration.

The rules & regulations and course structure given here are for the programs of M.E.(ES) and M.Tech.(CSE), framed as per Osmania University norms which are in tune with AICTE Model Curriculum 2018.

1. ELIGIBILITY FOR ADMISSION

Eligibility for Admission into M.E./M.Tech.Programmes is as per norms and procedures of Telangana State (TS) Government and Osmania University.

2. HOW TO APPLY

A candidate seeking admission into the M.E./M.Tech. Programme shall apply in the prescribed format as per the notification issued by the Convener, PGECET (on behalf of TSCHE) every academic year.

3. ADMISSIONS

Category – A Seats

The Convener, PGECET appointed by TSCHE will conduct the counseling for admission to PG programmes based on GATE score.

After exhausting the eligible GATE qualified candidates, remaining seats will be filled with Non-GATE candidates based on the merit at the Entrance Test conducted by the Convener, PGECET (on behalf of TSCHE).

No fulltime employee shall be admitted to the M.E./M.Tech. Course unless she shows proof of having taken leave for the period of the course.

All admissions for fulltime programmes are subject to reservation rules in force from time to time.

Category – B Seats

These seats shall be filled by the Institute as per the GOs issued by the Government of Telangana from time to time.

4. PROGRAMMES AND DURATION

The following P.G. programmes are offered:

(i) M.Tech.: Computer Science and Engineering

(ii) M.E.: Embedded Systems

The duration of M.E./M.Tech. Programme is of four semesters. The total period of study for the purpose of drawing the scholarship amount (if eligible) shall not exceed 24 months. The duration of each semester shall be of sixteen weeks.

The medium of instruction shall be English for all the Courses including their content delivery, examinations, seminars, presentations and project evaluation as prescribed in the programme curriculum.

5. COURSE REQUIREMENTS

The degree of M.E./M.Tech. will be conferred on a candidate who has (a) pursued a regular course of study of not less than three semesters of course work as prescribed here under and has passed all examinations in the subjects as prescribed in the Scheme of

Examination, and (b) submitted and successfully defended her Dissertation at the end of the fourth semester (Regular programme) as prescribed in the Scheme of Instruction and Evaluation.

The eligibility to appear the examination in any regular course of study conducted at the end of the semester is based on an attendance of not less than 75% in each of the subject registered during that semester.

However, in special cases and for sufficient causes shown, the Principal on the recommendation of HoD of corresponding department may condone the deficiency of not exceeding 10% attendance for ill-health subjected to submission of medical certificate to this effect. Absence not exceeding two weeks, for activities like N.S.S., Inter-University Competitions, Participations/Presentations in National/International Seminars/Conferences/Workshops and Debates will be condoned by the Principal on the recommendation of HoD of corresponding department.

As per the guidelines of Osmania University, in respect of women candidates who seek condonation of attendance due to pregnancy, the Principal of the college may condone the deficiency in attendance to the extent of 15% (as against 10% condonation for others) on medical grounds subjected to submission of medical certificate to this effect. Such condonation shall not be availed twice during the course of study.

If a candidate fails to secure the minimum requirement of 65% attendance in any subject, then she shall not be eligible to appear for the Semester End Examination in that subject. She shall be required to re-register and pursue the regular course of study in that subject.

If a candidate fails to maintain a minimum of 40% attendance in at least three theory subjects registered independently (excluding Seminar and Lab Courses) in the first semester following admission, then she shall forfeit her seat for the course and the admission automatically stands cancelled.

Every student on being admitted to the M.E./M.Tech. Programme shall be assigned to the Course Coordinator. With the approval of the Course Coordinator, the students shall draw a study plan to satisfy all the requirements, keeping in view the area of specialization and then register for the courses.

The online registration process should be completed within one week from the date of admission for the First Semester and within one week from the date of commencement of classes for subsequent semesters. For the benefit of those who are unsuccessful in the main examination or for those who wish to reappear in a subject(s), a make-up examination will be conducted. In case a candidate appears at both main and make-up

examinations in the same subject, better of the two grades shall be considered towards the final evaluation. The make-up examinations will be conducted after publication of the revaluation results. A candidate must register for the main examination at the end of the semester, failing which the candidate will be ineligible to register for the make-up examination.

In case, the make-up examination results are not declared before commencement of the new semester, the candidates may be permitted to register online, for the subject(s) & Dissertation Phase-I.

A student is permitted for online registration to Semester-III courses; if she has not more than three subjects as backlog from the previous semesters (Backlog for this purpose shall mean Theory courses/ Lab courses / Seminar). Moreover, the student is permitted for online registration to Dissertation Phase-I, if she has completed the requirements of Mini Project. However, if this criterion is not satisfied in case of any student, she will be permitted for online registration to Dissertation Phase-I in the subsequent even semester and for Dissertation Phase-II in the next odd Semester. If the candidate fails to fulfill the elective subjects then she can choose new electives, if required even in the IV semester along with Dissertation Phase-II. A student without any backlog only will be permitted to submit the Dissertation. Dissertation can be carried out at any recognized Institution/R&D Organization with the approval of the Head of the Department and Head of the Institution/Organization. In the IV semester normally Dissertation Phase-II will be there, however if any student requires to complete any Core of II semester or any electives, she can be permitted to register along with Dissertation Phase-II subject to a maximum of two subjects.

In the first two weeks of the third semester, a student shall seek a faculty member of the college who will be willing to be her supervisor for the dissertation and register for it, failing which, the Head of the Department shall assign Supervisor. The student may, in addition, can also have an External Supervisor from the organization to which she is attached as a Co-supervisor with the approval of Head of the Department concerned.

A student shall submit five copies of the Dissertation prepared in the standard prescribed format and approved by her supervisor on or before the date indicated in the Almanac. The format specifications are given in Appendix. Detailed Guidelines on documentation of Dissertation work will be issued separately. For such of those candidates who have not completed the courses and/or the Dissertation within the stipulated period, an additional period of one year in continuation may be given to complete the same by the Principal on application duly recommended by the concerned Head of the Department.

The maximum duration for completing all the requirements for obtaining the M.E./M.Tech. Programme shall be N+2 years from the date of admission, where 'N' represents the normal or minimum duration prescribed for completion of the programme.

6. SCHEME OF INSTRUCTION AND EXAMINATION

All examinations shall be held by STLW for which the schedule will be notified. Applications to appear in SEE shall be made only through online registration process, on payment of the prescribed fee.

When a candidate's application is found in order and she is found eligible to appear at the SEE, the Controller of Examinations (Examination Branch), STLW shall issue her with a Hall Ticket which must be produced by the candidate for entry into the examination hall.

A candidate is not entitled to claim refund of the examination fee. A student shall appear for the Semester End Examination at the end of each semester in the subjects registered online at the beginning of the semester only.

A candidate allowed to appear in the subject(s) for the main examination but is unable to secure minimum pass grade (D), may be permitted to re-appear at the subsequent make-up examination whichshall be conducted within one month from the declaration of the results of the main examination.

A candidate who is either unsuccessful at both the main and make-up examinations or has not appeared at all, shall have to reregister for the subjects and pass (core/elective course), irrespective of whether the syllabus remains the same or revised. Further, the candidate must undergo a regular course of study and secure a minimum of 75% attendance for eligibility to appear at the Semester End Examination. The Continuous Internal Evaluation (CIE) marks earned earlier stands cancelled. If the subject in which the candidate has failed in an elective, anew elective may be chosen if required. If a core course (subject) has been dropped in the curriculum, then the core course (subject) to be taken in place of the core course in which the candidate has failed will be specified by the Course Coordinator in consultation with the Chairperson, BoS.

Registration of minimum 50% or four students (whichever is the least) is required to offer a Programme Elective/Open Elective.

The distribution of Marks/Grades for the Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE) are as mentioned below.

S.No	Category of course	CIE	SEE
1.	Theory Courses	40 Marks	60 Marks

2.	Laboratory Courses	40 Marks	60 Marks
3.	Seminar	50 Marks	-
4.	Mini Project	50 Marks	-
5.	Dissertation Phase-I	100 Marks	-
6.	Dissertation Phase-II	-	200 Marks

CIE of Theory Courses (40 Marks):

Internal Evaluation (CIE) shall consist of sessional examination (Internal Exam– 25 M), Assignment (A-5M), Activity Based Assessment (10 M).

Internal Exam (25 Marks)

For theory Courses, Two sessional/Internal exams will be conducted and average of two sessional exams shall be calculated and used as the final sessional marks for each course. Each sessional examination shall be evaluated for 25 marks.

Question paper pattern for sessional examination (25 Marks) shall be as follows:

PART-A

5 X 2 M = 10 M (All questions are compulsory)

PART-B

3 X 5 M = 15 M (Part-B three out of four questions have to be answered)

Assignment (5 Marks): Student should submit any topic of that subject from a Journal (Each student should submit separate topic).

Activity Based Assessment (10Marks):

The Activity Based Assessment marks of each subject will be awarded by performing/ selecting any of the following activities during the semester.

Activity	**Max. Marks (10Marks)**
Paper presentation related to Subject oriented Conference	10
Attending related to Subject oriented Conference	5
Idea-Ideation related to Subject oriented - Award	10
Idea-Ideation related to Subject oriented -Participation	5
Presenting a talk on Advanced Topic of that subject	10
Presenting a talk on Topic from syllabus of that subject	5
Viva (Conducted by Course Committee)	10

A student can take part in any number of activities but, marks will be subjected to a maximum of 10 Marks.

CIE of Lab Courses (40 Marks):

Distribution of CIE of Lab Courses: 10 marks (Continuous Assessment), 10marks (Record) and 20 marks (Exam (10 marks Write up+10 marks for viva)).

SEE of Theory Courses (60 Marks):

Theory question paper of Semester End Examination (SEE) will have seven questions out of which the candidate has to answer any five questions including the first as compulsory question for twelve marks. The first question would consist of four to six short-answer type questions covering the entire syllabus. Remaining four questions out of six would carry twelve marks each.

SEE of Lab Courses (60 Marks):

Distribution of SEE of Lab Courses: 15 marks (Circuit Diagram, Experimental Procedure, Program), 10 marks (Conduct of Experiment), 10 marks (Results) and 15 marks (Viva), 10 marks (Record).

Seminar (50 Marks):

The distribution of CIE of Seminar is given below.

S. No.	Description	Max. Marks
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

Mini Project (50 Marks):

Each student will be allotted a supervisor to complete the Mini Project. The student has to present a seminar related to mini project work which is subject to evaluation for 50 marks. Out of 50 marks, the supervisor has to evaluate over 30 marks and remaining 20 marks has to be evaluated by an internal project review committee.

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Progress and Review
	10	Report
Internal project review committee	05	Relevance of the Topic
	05	Presentation
	05	Question and Answers
	05	Report Preparation

Dissertation Phase-I (100 Marks):

During Semester III, the student has to present Seminar on problem definition as well as progress of project work related to the Dissertation Phase-I.

The evaluation of Dissertation Phase-I consists of 100 marks out of which 50 marks are to be awarded by supervisor and 50marks to be awarded by internal project review committee.

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	30	Project Status / Review(s)
	20	Report
Internal Project Review Committee	10	Relevance of the Topic
	10	PPT Preparation
	10	Presentation
	10	Question and Answers
	10	Report Preparation

During Semester IV, the candidate has to continue the project work on the topic (same as in Semester-III) under Dissertation Phase-II, complete the project work and submit the dissertation on the entire project work carried out. The candidate must check for the plagiarism of dissertation using the software provided by STLW. The submission dissertation is acceptable provided the similarity index is less than 30%.

A student who has successfully completed all requirements of the programme is eligible to submit the M.E/M.Tech. Dissertation for evaluation.

Students who fail to submit their Dissertation and complete the examination formalities at the end of the fourth semester (as per the almanac notified) need to re-register for their dissertation work in the following semester (in no case later than the N+2 from the date of admission), where 'N' stands for the normal or minimum duration prescribed for completion of the programme. They will have to pay the prescribed fee for re-registration of Dissertation work every semester till the completion of their Dissertation work.

7. DISSERTATION EVALUATION PROCESS

The candidate who has passed all the courses and Departmental requirements has to present the Dissertation Phase-II as well as Dissertation for scrutinization and evaluation by Viva-Voce Committee. The viva- voce will be conducted as per the Almanac given by the Dean, Academics and will normally be twice in an academic year. However, special cases may be considered by Dean, Academics with recommendations of Chairperson, BOS.

The Viva-Voce committee will give a comprehensive report indicating the adequacy or otherwise of the Dissertation. If candidate's Dissertation work is found inadequate by the viva committee, she has to appear once again for the viva – voce examination. The candidate will have to revise the Dissertation as per the recommendations of the vice-voce

committee and submit the final copy within two weeks to the Examination Cell, STLW. The Examination Branch, STLW will send the Dissertation to the External Examiner as per the panel of examiners suggested bythe Chairperson, BoS. Within four weeks from the date of submission to the Examination Cell, the Examination Branch will arrange for the external viva-voce examination in consultation with the external examiner. The external viva-voce Committee consists of the Chairperson, BoS, External Examiner and Supervisor of the candidate. The Chairperson, Board of Studies is the Chairperson of the viva- voce Committee and supervisor is the Convener. The evaluation of Dissertation is for maximumof 200 marks and has to be done as per the guidelines given below:

i) 70 Marks are allocated for quality of Dissertation work covering

   (a) Literature review,(b)Innovation/Originality,(c)Research Methodology adopted and(d) Relevance/Practical applications.

ii) 70 Marks are provided for Report writing/ Documentation.

iii) 30 Marks are allocated for quality and clarity of presentation of Dissertation work.

iv) 30 Marks are provided for candidate's performance in terms of ability to defend the work, answer the queries raised during the viva-voce examination and overall subject knowledge.

TABLE-I

M.E./M.Tech. Four Semester Program Scheme of Instruction and Evaluation

S.No.	Course Name	Scheme of Instruction				Scheme of Examination			Credits
		L	T	P/D	Contact Hrs/W	CIE	SEE	Duration	
1	Program Core–I	3	1	-	4	40	60	3	4
2	Program Core–II	3	1	-	4	40	60	3	4
3	Professional Elective –I	3	-	-	3	40	60	3	3
4	Professional Elective–II	3	-	-	3	40	60	3	3
5	Compulsory Course	2	-	-	2	40	60	3	2
6	Audit Course –I	2	-	-	2	40	60	3	0
7	Laboratory– I	-	-	2	2	40	60	3	1
8	Laboratory–II			2	2	40	60	3	1
9	Seminar/Self Learning	-	-	4	4	50	-	3	2
	Total	**14**	**02**	**08**	**26**	**370**	**480**		**20**
10	Program Core –III	3	1	-	4	40	60	3	4
11	Program Core –IV	3	1	-	4	40	60	3	4
12	Professional Elective –III	3	-	-	3	40	60	3	3
13	Open Elective	3	-	-	3	40	60	3	3
14	Audit Course–II	2	-	-	2	40	60	3	0
15	Laboratory–III	-	-	2	2	40	60	3	1
16	Laboratory–IV	-	-	2	2	40	60	3	1
17	Mini Project with Seminar	-	-	4	4	50	-	3	2
	Total	**14**	**02**	**08**	**24**	**330**	**420**		**18**
18	Professional Elective–IV	3	-	-	3	40	60	3	3
19	Professional Elective–V	3	-	-	3	40	60	3	3

20	Major Project Phase–I	-	-	20	20	100	-	3	10
	Total	**06**	**-**	**20**	**26**	**180**	**120**		**16**
21	Major Project Phase – II(Dissertation)	-	-	32	32	-	200	3	16
Total		**-**	**-**	**32**	**32**	**-**	**200**		**16**
Grand Total									**70**

8. AWARD OF DEGREE

1. Minimum Qualifying Marks

Sl.No	Course particulars	CIE	SEE	CIE+SEE
1.	Theory Course	No Minimum	40%	50%
2.	Laboratory Course	No Minimum	50%	50%
3.	Seminar	50%	-	-
4.	Mini Project	50%	-	
5.	Dissertation Phase-I	50%	-	-
6.	Dissertation Phase-II	50%	50%	50%

2. In case of hearing impaired, orthopedically handicapped and visually challenged candidates, 10% reduction in pass marks in each subject is admissible as per G.O. Ms. No.150, dated 31-08-2006.

   A candidate desiring of revaluation in any course can apply as per STLW (A) norms and Notification of Exam Branch of STLW (A) issued at the time of declaration of results. A photocopy of valued theory answer script can be obtained on payment of the prescribed fee as mentioned in the notification.

   For the courses Field work/Internship will be evaluated by Internship Review Committee (IRC) in the respective Program

   Grades are awarded based on the combined marks secured in the Semester End Examination (SEE) (Maximum 60%) and Continuous Internal Evaluation (CIE) (Maximum 40%) as per the criteria stated in the following Table:

Academic Performance	Letter Grade		Grade Points
90%≤ Marks≤100%	O	Outstanding	10
80%≤ Marks<90%	A	Excellent	9
70%≤ Marks<80%	B	Very Good	8
60%≤ Marks<70%	C	Good	7
50%≤ Marks<60%	D	Average	6
0%≤Marks <50%	F	Fail	0
Ab	Absent	**0**	-

CONVERSION OF GRADES INTO PERCENTAGE

Conversion formula for the conversion of GPA into indicative percentage is [CGPA Earned-0.50] x10= % of marks scored. Illustration: [CGPA Earned 7.5 – 0.50] x 10 = 70.0%

AWARD OF DIVISION

Division is awarded on a 10-point scale as mentioned below:

CGPA Score	**Type of Grade Awarded**
8.00-10.00	First Division with distinction
6.50 and above but below 8.00	First Division
6.50 below and above 6.00	Second Division
below 6	Fail

The memorandum of marks of a candidate will reflect the grade secured by her as per the grading criteria described in the above Table. There is no minimum marks criterion for the Continuous Internal Evaluation (CIE) for theory subjects.

A minimum Cumulative Grade Point Average (CGPA) of 6 is required for the award of Degree. **The consolidated memorandum of marks will reflect the credits / grade scored in each subject.** The CGPA and Division (Class) awarded will be mentioned on Consolidated Marks Memo (CMM) and Provisional Certificate (PC).

Semester Grade Point Average (SGPA) &Cumulative Grade Point Average (CGPA)Calculation:

Semester Grade Point Average (SGPA) & Cumulative Grade Point Average (CGPA)

SGPA $= \Sigma$ (Letter Grade Point$_i$ X Credit$_i$)/Σ (Credit$_i$)

Where, i range overall Courses in that semester

CGPA $= \Sigma$ (SGPA$_j$ X Credits$_j$)/Σ (Credits$_j$)

Where j ranges overall semesters up to which the CGPA is computed.

SGPA is calculated up to second decimal point and it is calculated only when all subjects in that semester are cleared / passed.

CGPA at a given point of Semester is calculated up to second decimal point. It is calculated only when total credits earned are equal to total credits prescribed as per scheme up to a semester in which the candidate has last appeared for SEE.

A candidate can also obtain a photocopy of the corrected answer book of the theory

subjects of SEE only on payment of Rs.1000/- (Rupees one thousand only) for each subject, drawn in favour of Controller of Examination, Exam Cell, STLW as per the notification of Exam Cell.

9. AWARD OF GOLD MEDAL

A student securing highest marks scored in **single attempt** is eligible for award of Gold Medal.

10. TRANSITORY REGULATIONS

1. Whenever the schemes of Instruction and /or syllabi are changed for a course, candidate shall satisfy the unfulfilled requirements of passing the number of core subjects and electives choosing subjects from the revised schemes, with the approval of the Head of the Department.
2. Whenever a course or scheme of instruction is changed in a particular semester/year, two more examinations immediately following there after shall be conducted according to the old syllabus/regulations provided the content in the course has changed more than 40%.
3. Candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the changed syllabus/regulations.

11. MALPRACTICE AND AWARD OF PUNISHMENT

S.No	Malpractice	Award of Maximum Punishment
1.	Possession of the prohibited (written or printed) papers, books, notes during the examination period but which were not used.	Shall be debarred from appearing at the subsequent papers of the examination apart from cancelling the result of the examination in which she had indulged in malpractice.
2.	Matter relevant to the examination being written on any part of the body or on the clothes worn, or in the instruments, wrappings, etc.	-do-
3.	Attempting to take help from any prohibited papers, notes, written or printed matter, writings on the walls, furniture and attempting to take help from or giving help to other regarding answer to any question or questions of the examination paper.	-do-

4.	Taking help from or consulting of prohibited written or printed material; consulting and/or taking help from or helping other examinee during the examination period inside the examination hall or outside it; with or without their consent, or helping other candidate to receive help from anyone else.	-do-
5	An examinee who attempts to disclose her identity to the paper value by writing her roll number at a place other than the place prescribed for it, or by writing his/her name or any coded message or an examinee who makes an appeal to the paper value in the answer book	Cancelling the result of that paper
6	Writing such as invocation of God's name in any form.	To be ignored
7	Writing on the question paper or other papers; the answer to questions, rough work, etc., with no intention of passing it on to another examinee.	not to do so
8	Using abusive and obscene language in the answer book.	Cancellation of the result of that paper
9	Examinee allowing or destroying prohibited material found in his Possession or acting in any other manner with a view to destroy evidence.	Cancellation of the result of all Examinations taken or proposed to be taken during that session and prohibiting her admission to or continuation in any course of the University for a period of one year
10	Refusing to obey instructions of the Chief Superintendent/Invigilator.	Cancelling the result of that paper
11	Smuggling an answer book / additional answer book/matter into or out of the examination hall.	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting her admission to or continuation in any course of the Institution for a period of the year.
12	Inserting in or removing from the answer book/additional answer book of any sheet.	-do-
13	Substituting wholly or partly an answer book / additional answer book.	
14	Impersonation even at a single examination.	To be dealt with as per law

15	Cases of examinees when conspiring to interchange in Roll Nos.	Cancellation of the result of all examinations taken or proposed to be taken during that session and Prohibiting their Admission or constitution in any course of the University for a period of one year
16	Creation of disturbance or otherwise misbehaving in and around the examination hall during or before the examination.	Cancelling the results of all examinations taken or proposed to be taken during that session and prohibiting admission into or continuation in any course of study for a period of two years.
17	Guilty of assaulting/abusing intimidating any person connected with the examination work any time before, duringor after the examination Punishments for malpractices not defined here would be recommended on the merits of the individual cases by the Malpractices committee.	Cancelling the result of all examinations taken or proposed to be taken during that session and the next session and prohibiting admission into or continuation in any course for a period of two years.

APPENDIX

Format of M.E./M.Tech. Dissertation

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

(Affiliated to Osmania University)

CERTIFICATE

This is to certify that the Dissertation work entitled<Title of the Project Work>submitted by < Mr. / Ms. Name of the student (Roll No.) >, a student of Department of < Name of the Department >, < Name of the College > in partial fulfillment of the requirements for the award of the degree ofmaster of<Engineering/Technology>with<Name of the Specialization>as specialization is a record of the bonafide work carried out by < him / her > during the academicyear<Academic year>.

Date of submission of thesis

Signature of the Supervisor
<Name>
<Designation>
<Address>

Signature of Head of the Dept.
<Name >
<Designation>
<Address>

Seal

DECLARATION

I declare that the work reported in the Dissertation entitled < Title of M.E. / M. Tech. Thesis > is are cord of the work done by mean the Department of<Name of the Department, Place /Organization>.

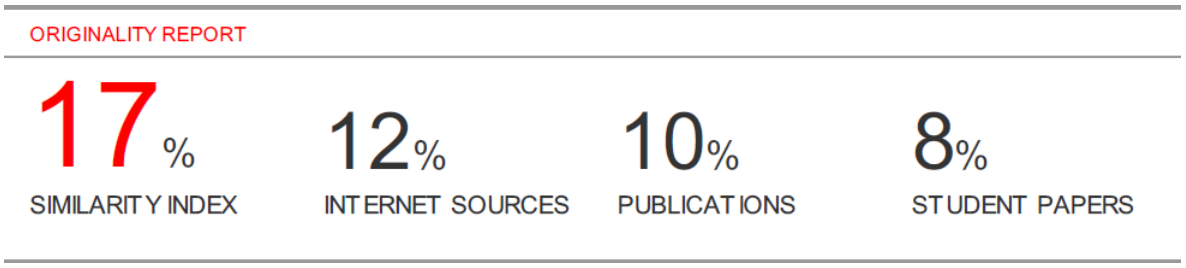
No part of the thesis is copied from books / journals / internet and wherever referred, the same has been duly acknowledged in the text. The reported data are based on the Dissertation work done entirely by me and not copied from any other source.

Signature of the Student

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)
(Affiliated to Osmania University)

Plagiarism Certificate

This is to certify that the thesis entitled '**Title of the dissertation**' submitted by **Name of the candidate**, towards partial fulfillment of the requirements for the award of the **Master of Engineering/Technology** degree in Engineering with specialization in was analyzed for Plagiarism. The Similarity Index was found to be % which is less than 30% as per Osmania University Faculty of Engineering norms.



(Signature of the Student) (Signature of the Supervisor)

(Signature of the Principal/ Coordinator, Anti Plagiarism Software)

Station: Hyderabad

Date:

12. Guidelines for preparing M.E./M.Tech. Dissertation

The Thesis must be presented on A-4 paper approximately11 inches /9 inches or 27.9 cm / 22cm and duly hard bound.

General:

1. The title of the thesis should be concise and clearly convey the work presented.
2. List of figures, tables, variables, symbols, acronyms etc. Should be included, before the start of the first chapter.
3. The abstract should not be more than 500 words.
4. A declaration stating the originally of work / results should be appended.
5. Any work which amounts to plagiarism should be totally avoided.
6. The entire thesis should be free from grammatical and spelling mistakes.
7. The total number of pages of the thesis should not normally exceed 250.
8. Any downloaded matter of tables or equations, if used, should be rewritten, and the source mentioned.
9. The first Chapter should clearly reflect the importance and objectives of the thesis.
10. A brief literature review may be included in the first or second chapter.
11. The organization of the thesis may be mentioned in the first chapter.
12. The pages should be numbered starting from the first page of the first chapter.
13. The pages before the first chapter should be numbered in small Roman numerals.
14. The headings and sub-headings should be properly numbered chapter wise.
15. Extension work may be indicated in the conclusion.
16. Uniform font and size should be followed for the titles of all chapters.
17. Uniform Indent should be followed throughout the text of the thesis.
18. Similarly uniformity should be maintained for all headings and sub headings.
19. Subscripts and superscripts should be adopted properly.

I. Formatting

1. The text should be presented at one and a half spacing.
2. The font size of the main text should be uniformly12 points throughout the thesis.
3. Left justification or left and right justification can be used for main text.
4. The left margin should be 30 -40 mm and the right. Top and bottom margins should be 25 to 30 mm.
5. The final dissertation copies should be hard bound in PURPLE colored in. The cover page should be gold embossed. On the spine of the dissertation the full name of the candidate and the year of submission should be gold embossed.

II. References

1. The references should be numbered from the first chapter to the last chapter in ascendingorderandthecorrespondingnumbershouldbeshowninsquarebracketswhereverrequired.
2. The reference should be listed with details after the last chapter.
3. All the references listed should be referred in the main text.
4. The references could be technical papers of Journals, conferences, symposia, workshops and seminars, technical reports, manuals, textbooks and software.
5. The important contents of referred materials should be in the following order: Name (s) of the author (s), Title of the paper, publication title, year of publication, Vol ,No. ,pp.

III. Appendices

1. Important programs, derivations, data and any other useful material may be shown in the appendices with proper numbering.
2. The appendices should be numbered in capital Roman numbers or capital letters from the first chapter to the last chapter in ascending order. (eg. Appendix1 or Appendix A)
3. The appendices should be shown with details after the last chapter.
4. All the appendices should be referred in the main text.

IV. Equations

1. All the equations used in the thesis should be properly numbered chapter wise(eg.Eq,3.1or)
2. The equations shown should be clearly referred and identified as Eq. or eq. followed by equation number.
3. Repetition of equations should be avoided. If needed, it may be referred by its number.
4. Equations should never be mixed up with main text .It should be shown as separate object and‘Equation Editor’ can be used.

V. Tables

1. The tables shown in the thesis should be clearly referred and explained and they should benumbered properly.
2. At the top of the table, it should be identified as table, followed by table number (ex.Table.3.1)
3. The caption of the table should be written clearly, precisely and briefly at the same position.
4. As pacing fat least 3 points should be taken for the first line of each cell.
5. Table size should not cross the limits of the set page margins.
6. The font size should be less than or equal to the font size of main text.

VI. Figures

1. The figures shown in the thesis should be clearly referred and explained. They should be numberedproperly chapter wise.
2. At the bottom of the figure, it should be identified as fig. or figures, followed by figure number (ex.Fig3.1 orfigure3.1).
3. The caption of the figure should be written clearly, precisely and briefly at the same position.
4. All the graphs and flowcharts should be identified and presented the same way as figures.
5. All the figures and graphs should be drawn clearly, so that variables, units, markings and details aredissembled.
6. All the drawings, textboxes, images and details related to a particular figure should be groupedtogether.
7. The font size used should be less than or equal to the font size of main text.
8. The figure size should not exceed the set page margins.

SCHEME OF INSTRUCTION & EXAMINATION

M.E.(Embedded Systems)
Semester I

S. No.	Course Type/Code	Course Name	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs./W	CIE	SEE	Duration in Hrs.	
Theory Courses										
1	SPC3301ES	Micro Controllers for Embedded System Design	3	1	-	4	40	60	3	4
2	SPC3202ES	Smart Sensors for Internet of Things	3	1	-	4	40	60	3	4
3	Elective	Professional Elective – I	3	-	-	3	40	60	3	3
4	Elective	Professional Elective – II	3	-	-	3	40	60	3	3
5	SCC5161 ES	Research Methodology & IPR	2	-	-	2	40	60	3	2
6	Audit	Audit Course – I	2	-	-	2	40	60	3	-
Practical/ Laboratory Courses										
7	SPC3251ES	Embedded System Laboratory – I	-	-	2	2	40	60	3	1
8	SPC3252ES	IoT Laboratory – I	-	-	2	2	40	60	3	1
9	SPC3255ES	Seminar/Self Learning	-	-	4	4	50	-	3	2
		Total	**14**	**02**	**08**	**26**	**370**	**480**		**20**

PC: Program Core **PE:** Professional Elective **OE**: Open Elective **AD**: Audit Course
CC: Compulsory Course **HS**: Humanities and social science

L: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note:

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a laboratory.
3. Open Elective Subject is not offered to the students of ECE Department.

M.E.(Embedded Systems)
Semester II

S. No.	Course Type/Code	Course Name	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs./Wk.	CIE	SEE	Duration in Hrs.	
Theory Courses										
1	SPC3203ES	Programming and Interfacing with Microcontroller	3	1	-	4	40	60	3	4
2	SPC3204ES	IoT Applications and Communication Protocols	3	1	-	4	40	60	3	4
3	Elective	Professional Elective – III	3	-	-	3	40	60	3	3
4	OE	Open Elective	3	-	-	3	40	60	3	3
5	Audit	Audit Course – II	2	-	-	2	40	60	3	-
Practical/ Laboratory Courses										
6	SPC3253ES	Embedded System Laboratory – II	-	-	2	2	40	60	3	1
7	SPC3254ES	IOT Laboratory – II	-	-	2	2	40	60	3	1
8	SPC3256ES	Mini Project with Seminar	-	-	4	4	50	-	3	2
		Total	**14**	**02**	**08**	**24**	**330**	**420**	-	**18**

PC: Program Core **PE:** Professional Elective **OE**: Open Elective **AD**: Audit Course
CC: Compulsory Course **HS**: Humanities and Social Science

L: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note:

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a laboratory.
3. ** Open Elective Subject is not offered to the students of ECE Department.

M.E.(Embedded Systems)
Semester III

S. No.	Course Type/Code	Course Name	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs./W	CIE	SEE	Duration in Hrs.	
Theory Courses										
1	Elective	Professional Elective – IV	3	-	-	3	40	60	3	3
2	Elective	Professional Elective – V	3	-	-	3	40	60	3	3
3	SPC3257ES	Major Project Phase – I	-	-	20	20	100	-	3	10
		Total	**06**	**-**	**20**	**26**	**180**	**120**	-	**16**

M.E.(Embedded Systems)
Semester IV

S. No.	Course Type/Code	Course Name	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs./W	CIE	SEE	Duration in Hrs.	
Theory Courses										
1	SPC3258ES	Major Project Phase – II (Dissertation)	-	-	32	32	-	200	3	16
		Total	**-**	**-**	**32**	**32**	**-**	**200**		**16**
		Grand Total								**70**

PC: Program Core **PE:** Professional Elective **OE**: Open Elective **AD**: Audit Course
CC: Compulsory Course **HS**: Humanities and Social Science

L: Lecture **T**: Tutorial **P**: Practical **D**: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note:

1. Each contact hour is a Clock Hour.
2. The practical class can be of two and half hour (clock hours) duration as per the requirement of a laboratory.
3. ** Open Elective Subject is not offered to the students of ECE Department.

M.E.(Embedded Systems)

List of subjects of Professional Core

S. No.	Course Code	Course Title
1	SPC3301ES	Micro Controllers for Embedded System Design
2	SPC3202ES	Smart Sensors and Internet of Things
3	SPC3203ES	Programming and Interfacing with Microcontroller
4	SPC3204ES	IoT Applications and Communication Protocols

List of subjects of Professional Electives I to V

S. No.	Course Code	Course Title
1	SPE3216ES	Wireless Sensor Protocols and Programming
2	SPE3217ES	Advance Wireless and Mobile Networks
3	SPE3218ES	Wireless Access Technologies
4	SPE3219ES	Embedded Linux and Basics of Device Drivers
5	SPE3220ES	Neural Networks and Fuzzy Logic
6	SPE3221ES	Privacy and Security in IoT
7	SPE3222ES	IoT: Sensing and Actuator Devices
8	SPE3223ES	Energy Harvesting Technology and Power Management for IoT Devices
9	SPE3224ES	Scripting Languages
10	SPE3225ES	Image and Video Processing
11	SPE3226ES	Kernel and Driver Programming
12	SPE3227ES	Cloud Computing
13	SPE3228ES	Mobile Computing
14	SPE3319ES	SoC Design
15	SPE3303ES	Real Time Operating Systems (Elective)
16	SPE3304ES	Programming Languages for Embedded Software
17	SPE3305ES	Machine Learning

List of Compulsory Courses

S. No.	Course Code	Course Title
1	SCC5161ES	Research Methodology & IPR

List of Open Electives

S. No.	Course Code	Course Title
1	SOE9101CE	Cost Management of Engineering Projects
2	SOE9102CS	Business Analytics
3	SOE9103 EC**	Embedded System Design
4	SOE9104EE	Waste to Energy
5	SOE9105ME	Industrial Safety

Note: ** Open Elective Subject is not offered to the studentsDepartment.

M.E.(Embedded Systems)

List of subjects of Audit Course-I

S. No.	Course Code	Course Title
1	SAD9001HS	English for Research Paper Writing
2	SAD9002CE	Disaster Management
3	SAD9003HS	Sanskrit for Technical Knowledge
4	SAD9004HS	Value education

List of subjects of Audit Course-II

S. No.	Course Code	Course Title
1	SAD9011HS	Constitution of India and Fundamental Rights
2	SAD9012HS	Pedagogy Studies
3	SAD9013HS	Stress Management by Yoga
4	SAD9014HS	Personality Development through life Enlightenment Skills

List of Laboratory Courses

S. No.	Lab No.	Course Code	Course Title
1	I	SPC3251ES	Embedded Systems Lab – I
2	II	SPC3252ES	IoT Lab-I
3	III	SPC3253ES	Embedded Systems Lab – II
4	IV	SPC3254ES	IoT Lab-II

DETAILED SYLLABUS

Course Code	Course Title						Core/Elective
SPC3301ES	**Microcontrollers for Embedded System Design**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

- Detailed overview of important concepts of Embedded system
- Analyze PIC microcontroller, its features and programming
- Describe ARM Microcontroller architectural details and instruction set
- Understand ARM Memory management
- Learn the techniques to develop an embedded system and case studies

Course Outcomes

After completing this course, the student will be able to:

1. Define an embedded system with an overview of important concepts and trends in the design process along with the challenges faced in the embedded systems design.
2. Understand the architecture of PIC 18 Microcontroller, its features and programming.
3. Understand ARM Design Philosophy, architectural details, instruction set and ARM Memory Management.
4. Analyse and compare the utility and effectiveness of various debugging tools and techniques.
5. Design a real time based embedded system in the area of communication, automotive,etc.

UNIT I

Introduction to Embedded Systems: Overview of Embedded System Architecture, Challenges & Trends of Embedded Systems, Hardware Architecture, Software Architecture. Application areas of Embedded Systems and Categories of Embedded Systems. Embedded System Design and Co-Design issues and Design Cycle Process

UNIT II

PIC 18: Family Overview, Architecture, Instruction Set, Addressing modes. Timers, interrupts of PIC 18, Capture/Compare and PWM modules of PIC 18

UNIT III

ARM Architecture: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families. Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT IV

ARM Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instruction Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions. Exception and interrupt handling.

ARM Memory Management: Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation Access Permissions, Context Switch.

UNIT V

Embedded Software Development Tools, Host and Target Machines, Linkers/Locators for Embedded Software, Getting Embedded Software into the Target System. Debugging Techniques.

Case Studies: Design of Embedded Systems using Microcontrollers – for applications in the area of communication and automotive. (GSM/GPRS, CAN, ZigBee)

Suggested Reading:

1. Raj Kamal, *Embedded Systems – Architecture, Programming and Design*, 2nd Edition, TMH,2008.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, *ARM Systems Developer's Guides – Designing & Optimizing System Software*, Elsevier,2008.
3. Mazidi, MCKinlay and Danny Causey, *PIC Microcontrollers and Embedded Systems*, Pearson Education,2007
4. David.E. Simon, *An Embedded Software Primer*, 1st Edition, Pearson Education,1999
5. Jonathan W. Valvano, *Embedded Microcomputer Systems, Real Time Interfacing*, ThomasLearning, 1999.

Course Code	Course Title						Core/Elective
SPC3202ES	**Smart Sensors for Internet of Things**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

- Able to understand the application areas of IoT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics
- Able to understand smart sensors principles
- Able to interface smart sensors

Course Outcomes

After completing this course, the student will be able to:

1. Understand the vision of IoT from a global context
2. Use of Devices, Gateways and Data Management in IoT.
3. Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.
4. Understand different sensor architectures
5. Develop different types of applications by using sensors

UNIT I

Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IoT

UNIT II

Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications, Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc.

UNIT III

Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modelling of Sensors Importance and Adoption of Smart Sensors

UNIT IV

Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapour, Anodization,Sol-gel

UNIT V

Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor and Future scope of research in smart sensor

Suggested Reading:

1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing
2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing

Course Code	Course Title						Core/Elective
SPC3203ES	**Programming and Interfacing with Microcontroller**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

- Understand advanced and emerging networking technologies
- Obtain skills to do advanced networking research and programming
- Learnhowtousesoftwareprogramstoperformvaryingandcomplexnetworkingtasks
- Expand upon the knowledge learned and apply it to solve real world problems
- Learn IoT protocols

Course Outcomes

After completing this course, the student will be able to:

1. Summarise different open source platforms and open frameworks
2. Study different communication protocols
3. Design a specific application by using sensors andactuators
4. learn different messaging standards for communication over theinternet
5. Learn basic communication techniques to send data tocloud

UNIT I

Introduction – History - Creative Coding Platforms - Open Source Platforms – PIC - Arduino, Sketch, Raspberry Pi, Iterative coding methodology – Python Programming - Mobile phones and similar devices - Arm Devices - Getting used to Arduino - Sensor Characterization: Safety, Basic Electronics (circuit theory, measurements, parts identification) Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World

UNIT II

Software: open Frameworks as our IDE (C/C++) - "Arduino" Language (C/C++) - Hardware: Desktop / Laptop / Raspberry Pi - How to approach a programming problem? Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc. Analog to Digital Conversion (ADC) - Digital to Analog Conversion (DAC) – Microcontrollers

UNIT III

Communication – Serial& Parallel - Hardware to Hardware Communication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication - Introduction to the command line– git/GitHub.Introduction to Programming: Acomparative studio between Arduino+ open Frameworks Arduino-compatible Microcontrollers Sensors and Actuators

UNIT IV

Advanced I/O – open Frameworks: Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL, SQLite, XML, PHP/Web) - Arduino: Wired/Wireless Networking

UNIT V

Talking to the cloud: Baby steps to Internet of Things, TCP/IP and UDP - Building peer to peer communication system using Bluetooth &WiFi - Experiments

Suggested Reading:

1. Programming Interactivity, Second Edition by Josha Noble,2012
2. Programming the Raspberry Pi: Getting Started with Python 2E,2016

Course Code	Course Title						Core/Elective
SPC3204ES	**IoT Applications and Communication Protocols**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

- Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wire line protocols
- Mobile to Electronics integration, Mobile to enterprise integration
- Open source/commercial electronics platform for IoT-Raspberry Pi, Arduino, ArmMbedLPC
- Open source /commercial enterprise cloud platform for IoT-Ayla, iO Bridge, Libellium,Axeda, Cisco fog cloud
- Learn different M2Mplatforms

Course Outcomes

After completing this course, the student will be able to:

1. To understand merging technological options, platforms and case studies of IoT implementation in home & city automation
2. Understand database implementation for IoT
3. Determine the Market perspective of IoT
4. Experience with working of cloud computing service
5. Design a specific application by using IoT

UNIT I

Basic function and architecture of a sensor — sensor body, sensor mechanism, sensor calibration, sensor maintenance, cost and pricing structure, legacy and modern sensor network. Different kind of calibration Techniques: manual, automation, infield, primary and secondary calibration — and their implication in IoT Powering options for sensors: battery, solar, Witricity, Mobile and PoE

UNIT II

ZigBee and Zwave — advantage of low power mesh networking. Long distance ZigBee. Introduction to different ZigBee chips. Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Introduction of Bluetooth vendors &their review. Wireless protocols such as Piconet and packet structure for BLE and ZigBee Other long distance RF communication link. LOS vs NLOS links, Capacity and throughput calculation Application issues in wireless protocols: power consumption, reliability, PER, QoS, LOS

UNIT III

PCB vs FPGA vs ASIC design Prototyping electronics vs Production electronics QA certificate for IoT- CE/CSA/UL/IEC/RoHS/IP65 Basic introduction of multi-layer PCB design and its workflow Electronics reliability-basic concept of FIT and early mortality rate Environmental and reliability testing-basic concepts Basic Open source platforms: Arduino, Raspberry Pi, Beaglebone

UNIT IV

Introduction to Mobile app platform for IoT: Protocol stack of Mobile app for IoT, Mobile to server integration, iBeacon in IoS, Window Azure, Linkafy Mobile platform for IoT, Axeda, Xively

UNIT V

Database implementation for IoT: Cloud based IoT platforms, SQL vs NoSQL, Open sourced vs. Licensed Database, Available M2M cloud platform, AxedaXively, Omega NovoTech, Ayla Libellium, CISCO M2M platform, AT &T M2M platform, Google M2M platform, Recent trends in home automation, IoT-locks, Energy optimization in home

Suggested Reading:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley-Blackwell.

Course Code	Course Title						Core/Elective
SPE3216ES	**Wireless Sensor Protocols and Programming**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Understand basic sensor network concepts
- Know physical layer issues, understand and analyse Medium Access Control Protocols
- Comprehend network and transport layer characteristics and protocols and implement conventional protocols
- Understand the network management and Middleware services
- Understand the protocols for network security.

Course Outcomes

After completing this course, the student will be able to:

1. Present applications of wireless sensors and communication deployment mechanisms
2. Describe MAC layer protocols
3. Carry out reliable data transfer protocols and routing algorithms in given networks and mechanisms for security
4. Understand IoT protocols
5. Handle routing management, network security and attacks in OS

UNIT I

Fundamentals of Sensor Networks: Introduction to computer and wireless sensor networks and Overview of the syllabus- Motivation for a network of Wireless Sensor nodes- Sensing and sensors- challenges and constraints - node architecture-sensing subsystem, processor subsystem communication interfaces- prototypes, Application of Wireless sensors- Introduction of Tiny OS Programming and TOSSIM Simulator.

UNIT II

Communication Characteristics and Deployment Mechanisms: Wireless Transmission Technology and Systems-Radio Technology Primer-Available Wireless Technologies - Hardware-Telosb, Micaz motes- Time Synchronization- Clock and the Synchronization Problem - Basics of time Synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization

UNIT III

MAC Layer: Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols- Power Aware Multi-Access with signalling, Sensor MAC-Timeout MAC-Data gathering MAC- Case study – Implementation and Analysis of MAC player protocol in TinyOS

UNIT IV

Routing in Wireless Sensor Networks: Design Issues in WSN routing- Data Dissemination and Gathering- Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical

Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing- Geographical Based Routing- Transport layer- Transport Protocol Design issues- Performance of Transport Control

Protocols. Case study- Implementation and analysis of Routing protocol or transport layer protocol in Tiny OS

UNIT V

Middleware and Security Issues: WSN middleware Principles-Middleware Architecture-Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security. Case study- Handling attacks in Tiny OS

Suggested Reading:

1. WaltenegusDargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing,2011
2. Kazem Sohraby, Daniel Manoli, "Wireless Sensor networks- Technology, Protocolsand Applications", Wiley InterScience Publications2010.
3. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge University Press,2005
4. C.S Raghavendra, Krishna M. Sivalingam, Taiebznati, "Wireless Sensor Networks", Springer Science2004.

Course Code	Course Title						Core/Elective
SPE3217ES	**Advanced Wireless and Mobile Networks**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
- To learn how to design and analyse various medium access
- To learn how to evaluate MAC and network protocols using network simulation software tools
- The students should get familiar with the wireless/mobile market and the future needs and challenges

Course Outcomes

After completing this course, the student will be able to:

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Develop mobile applications to solve some of the real-world problems**.**
4. Work with IoT communication techniques
5. Understand Vehicular Adhoc Networks

UNIT I

Introduction: Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

Wireless Local Area Networks: IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

UNIT II

Wireless Cellular Networks: 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

UNIT III

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

Wireless Sensor Networks: Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

UNIT IV

Wireless PANs: Bluetooth AND ZigBee, Introduction to Wireless Sensors.

UNIT V

Security: Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.

Advanced Topics: IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

Suggested Reading:

1. Schiller J., Mobile Communications, Addison Wesley2000
2. Stallings W., Wireless Communications and Networks, Pearson Education2005
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and ImrichChlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI200

Course Code	Course Title						Core/Elective
SPE3218ES	**Wireless Access Technologies**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Overview of wireless access technologies, Fixed wireless access networks. Terminal mobility issues regarding wireless access to Internet
- Introduction to various Network topologies, hotspot networks, Communication links: point-to-point, point-to-multipoint, multipoint-to-multipoint.
- To provide an overview of Standards for most frequently used wireless access networks: WPAN, UWB, WLAN, WMAN, WWAN. Network services. Wireless access networks planning, design and installation.
- To get and insight of Wireless networking security issues, Wireless access network exploitation and management, software requirements, link quality control.
- Study Recent trends in wireless networking and various access mechanism, new standards of wireless communication.

Course Outcomes

After completing this course, the student will be able to:

1. compare various wireless access technologies
2. analyze measurements of wireless access network parameter
3. assess security issues in wireless networks
4. Solve Wireless networking security issues
5. Design Wireless access networks

UNIT I

Necessity for wireless terminals connectivity and networking. Wireless networking advantages and disadvantages, Overview of wireless access technologies. Narrowband and broadband networks, fixed and nomadic networks. Wireless local loop (WLL), Public Switched Telephone Network (PSTN) interfaces.

UNIT II

Fixed wireless access (FWA) networks, frequency bands for different networks. Criterions for frequency bands allocation, Network topologies, hotspot networks. Communication links: point-to-point (PTP), point to-multipoint (PMP), multipoint-to-multipoint (MTM).

UNIT III

Standards for most frequently used wireless access networks: WPAN (802.15, Bluetooth, DECT, IrDA), UWB (Ultra-Wideband), WLAN (802.11, Wi-Fi, HIPERLAN, IrDA), WMAN (802.16, WiMAX, HIPERMAN, HIPERACCESS), WWAN (802.20), Other technologies for broadband wireless access, Local Multipoint Distribution Service (LMDS), Multichannel Multipoint Distribution Service (MMDS). Ad Hoc networks, Network services. Services types based on carrier frequency and bandwidth.

UNIT IV

Wireless access networks planning, design and installation. Services provision, legislative and technical aspects, Technical and economic factors for network planning: expenses, coverage, link capacity, network complexity and carrier-to-interference ratio (C/I). Base station or access point allocation. Base station and access point equipment. Terminal mobility issues regarding wireless access to Internet. Wireless networking security issues.

UNIT V

Example of laptop or handheld PC wireless connection in real environment. PC wireless interface equipment. Wireless access network exploitation and management, software requirements, link quality control. Business model, wireless network services market, market research and marketing, service providers, wireless data application service providers (WDASP) and their role on public telecommunication services market, billing systems. Recent trends in wireless networking and various access mechanism, new standards of wireless communication.

Suggested Reading:

1. M. P. Clark, Wireless Access Networks: Fixed Wireless Access and WLL networks -- Design and Operation, John Wiley & Sons,Chichester
2. D.H.Morais,FixedBroadbandWirelessCommunications:PrinciplesandPracticalApplications, Prentice Hall, Upper SaddleRiver
3. R.Pandya,Introduction to WLLs: Application and Deployment for Fixed and Broad band Services, IEEE Press, Piscataway

Course Code	Course Title						Core/Elective
SPE3219ES	**Embedded Linux and Basics of Device Drivers**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Able to understand embedded Linux development environment, understand and create Linux BSP for a hardware platform
- Able to program different embedded storage devices
- Able to understand the Linux model for embedded storage, understand and write various embedded Linux drivers such as serial, I^2C, and soon.
- Able to port applications to embedded Linux and write real– time applications in embedded Linux

Course Outcomes

After completing this course, the student will be able to:

1. Get familiar with the functions of Linux operating systems
2. Writing of device driver programming in Linux
3. Understand how to configure, build, install and boot from a kernel
4. write various embedded Linux drivers such as serial, I^2C, and soon
5. Experience Hard Real-Time Linux

UNIT I

Introduction: History of Embedded Linux, Embedded Linux versus Desktop Linux, Embedded Linux Distributions, Architecture of Embedded Linux, Linux Kernel Architecture, Linux Start Up Sequence, GNU Cross-p\Platform Tool chain.

UNIT II

Board Support Package: Inserting BSP in Kernel Build Procedure, Boot Loader Interface, Memory Map, Interrupt Management, PCI Subsystem, Timers, UART, and Power Management.

Embedded Storage: Flash Map, MTD—Memory Technology Device, MTD Architecture, Flash Mapping Drivers, MTD Block and Character devices, Embedded File systems, Optimizing Storage Space.

UNIT III

Embedded Drivers: Linux Serial Driver, Ethernet Driver, I2C subsystem on Linux, USB Gadgets, Watchdog Timer, and Kernel Modules.

UNIT IV

Porting Applications: Architectural Comparison, Application Porting Road Map, Programming with Pthreads, Operating System Porting Layer (OSPL), Kernel API Driver.

UNIT V

Real-Time Linux: Linux and Real-Time, Real-Time Programming in Linux, Hard Real-Time Linux.

Suggested Reading:

1. Embedded Linux System Design and Development, P. Raghavan, Amol Lad, SriramNeelakandan, 2006, AuerbachPublications
2. Embedded Linux – Hardware, Software and Interfacing

Course Code	Course Title						Core/Elective
SPE3220ES	**Neural Networks and Fuzzy Logic**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Formulate neural networks
- Understand Training of neural networks using various algorithms
- Use of neural networks for pattern recognition
- Learn fuzzy systems, application of fuzzy systems
- Describe Comparison of fuzzy systems with conventional control system.

Course Outcomes

After completing this course, the student will be able to:

1. Analyze the various feedback networks
2. Apply genetic algorithms to combinatorial optimization problems
3. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
4. Analyze the application of fuzzy logic control to real time systems.
5. Analyze the application of fuzzy logic control to real time systems.

UNIT I

Introduction to ANS (Artificial Neural systems) Technology, ANS simulation, Types of Neural Networks: Hopfield, perceptron and related models, Adaline and Madaline: Adaline and the Adaptive Linear Combiner, the Madaline and simulating the Adaline. Essential vector operations, Lateral Inhibition and Sensory Processing.

UNIT II

Probabilistic Models, Fuzzy ARTMAP and Recurrent Networks: Probabilistic Neural Networks, General Regression Neural Networks, Fuzzy ARTMAP, Recurrent Back Propagation Neural Networks, Hybrid Learning Neural Networks: Counter propagation Network, Radial basis Function Networks.

UNIT III

Application of Neural Networks: Design and optimization of Systems: Non-Linear optimization, Inverse design problems, Pattern Recognition Applications: Control Chart Pattern Recognition, Recognition of Machine-Cells in a group technology layout. Complex pattern Recognition tasks: Pattern mapping, Temporal patters, pattern variability, Neocognitron, Addition of lateral inhibition and Feedback to the Neocognitron.

UNIT IV

Introduction to Fuzzy systems, Fuzzy sets and operations on Fuzzy sets, Basics of Fuzzy relations, Fuzzy measures, Fuzzy integrals, Transform Image coding with Adaptive Fuzzy systems, Adaptive FAM systems for Transform coding.

UNIT V

Comparison of Fuzzy and Kalman-Filter Target, Tracking control systems, Fuzzy and Math Model

Controllers, Real Time Target Tracking, Fuzzy Controller, Kalmaln-Filter Controller, Fuzzified CMAC and RBF – Network based self-learning Controllers.

Suggested Reading:

1. James A. Freeman and David M. Skapura, *Neural Networks: Algorithms, Applications and Programming Techniques*, Pearson Education, India,2008.
2. James A. Anderson, *An introduction to Neural Networks*, PHI,2003.
3. B. Yegnanarayana, *Artificial Neural Networks*, PHI Publications India,2006.
4. Timothy J. Ross *Fuzzy Logic with Engineering Applications*, McGraw Hill2004.
5. Bart Kosko, *Neural Networks and Fuzzy Systems*, PHI India Publications,2008.

Course Code	Course Title						Core/Elective
SPE3221ES	**Privacy and Security in IoT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Ability to understand the Security requirements in IoT
- Understand the cryptographic fundamentals for IoT
- Ability to understand the authentication credentials and access control
- Understand the various types Trust models and Cloud Security.
- Understand New directions in cloud enabled IoT computing

Course Outcomes

After completing this course, the student will be able to:

1. Identify and analyse IoT security and privacy risks
2. Concept design for secure hardware and software
3. Analyse the social and privacy impacts of the IoT
4. Design self-organising things for security
5. Understand New directions in cloud enabled IoT computing

UNIT I

Introduction - Securing the Internet of Things: Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - Insufficient Authentication/Authorization - Insecure Access Control Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities–Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees

UNIT II

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 – IoT Node Authentication

UNIT III

Identity & Access Management Solutions for IoT: Identity lifecycle – authentication credentials – IoT IAM infrastructure – Authorization with Publish / Subscribe schemes – access control

UNIT IV

Privacy Preservation and Trust Models for IoT: Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.

UNIT V

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.

Suggested Reading:

1. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
2. Securing the Internet of Things,Elsevier
3. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations

Course Code	Course Title						Core/Elective
SPE3222ES	**IoT: Sensing and Actuator Devices**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
- UnderstandIoTsensorsandtechnologicalchallengesfacedbyIoTdevices,withafocusonwireless, energy, power, RF and sensing modules
- Analyse the technologies in sensors and actuators
- Market forecast for IoT devices with a focus on sensors
- Explore and learn about Internet of Things with the help of preparing projects designed for RaspberryPi

Course Outcomes

After completing this course, the student will be able to:

1. Develop thinking of making new generations of sensors
2. Analyse power management
3. Design an IoT project
4. Design wearable devices
5. Design Prototypes

UNIT I

Introduction: Internet of Things Promises–Definition – Scope–Sensors for IoT, Applications– Structure of IoT– IoT Map Device.

UNIT II

Seven Generations of IoT Sensors to Appear: Industrial sensors – Description & Characteristics– First eneration – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics– Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

UNITIII

Technological Analysis: Wireless Sensor Structure–Energy Storage Module–Power ManagementModule– RF Module–Sensing Module

UNIT IV

IoT Development Examples: ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks Focus on Wearable Electronics

UNIT V

Preparing IoT Projects: Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensorvalues

- Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial portion

Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings Initializing the camera

Suggested Reading:

1. Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Développement Copyrights,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing,2015
3. Editors Ovidiu Vermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers,2014
4. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers,2014.

Course Code	Course Title						Core/Elective
SPE3223ES	**Energy Harvesting Technologies and Power Management for IoT Devices**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Understand the various energy sources and energy harvesting based sensor networks
- Learn about the various Piezoelectric materials and Non-linear techniques
- Learn principles of Electromagnetic Energy Harvesting and Non-Linear Techniques
- Understand the various Power sources for WSN
- Learn about the applications of Energy harvesting systems.

Course Outcomes

After completing this course, the student will be able to:

1. Develop Novel energy harvesting hardware, devices, systems
2. Design Self-sustaining wearable devices
3. Recognise alternative power sources for embedded applications, such as novel nuclear, chemical, or biological for energy harvesting
4. Design Bio-MEMS based applications

UNIT I

Energy Harvesting Systems: Introduction – Energy sources – energy harvesting based sensor networks – photovoltaic cell technologies – generation of electric power in semiconductor PV cells – types

UNIT II

Piezo-Electric Energy Harvesting and Electromechanical Modelling: Piezoelectric materials – transducers – harvesters – microgenerators – strategies for enhancing the performance of energy harvesters. Electromechanical modelling of Lumped parameter model and coupled distributed parameter models and closed-form solutions

UNIT III

Electromagnetic Energy Harvesting and Non-Linear Techniques: Basic principles – micro fabricated coils and magnetic materials – scaling – power maximations – micro and macro scale implementations. Non- linear techniques – vibration control & steady state cases

UNIT IV

Energy Harvesting Wireless Sensors: Power sources for WSN – Power generation – conversion – examples – case studies. Harvesting microelectronic circuits – power conditioning and losses.

UNIT V

Selected Applications of Energy Harvesting Systems: Case studies for Implanted medical devices – Bio- MEMS based applications – harvesting for RF sensors and ID tags – powering wireless SHM sensor nodes.

Suggested Reading:

1. Carlos Manuel Ferreira Carvalho, Nuno Filipe Silva VeríssimoPaulino, “CMOS IndoorLight Energy Harvesting System for Wireless Sensing Applications”,Springer
2. Danick Briand, Eric Yeatman, Shad Roundy, “Micro EnergyHarvesting”

Course Code	Course Title						Core/Elective
SPE3224ES	**Scripting Languages**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- The principles of scripting languages.
- Motivation for and applications of scripting.
- Difference between scripting languages and non- scripting languages.
- Types of scripting languages.
- Scripting languages such as PERL, TCL/TK, python and BASH.

Course Outcomes

After completing this course, the student will be able to:

1. Demonstrate knowledge and understanding of the nature of scripting and the role of scripting languages
2. Writesimplescriptstoautomatesystemadministrationtasksusingappropriatelanguages
3. Develop simple applications using appropriate tools.
4. Creation of programs in the Linux environment.
5. Usage of scripting languages in IC design flow.

UNIT I

Linux Basics: Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts

UNIT II

Linux Networking Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

UNIT III

Perl Scripting: Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

UNIT IV

Tcl / Tk Scripting: Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List Box Widgets Focus, Grabs andDialogs.

UNIT V

Python Scripting: Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Suggested Reading:

1. Learning Python – 2nd Ed., Mark Lutz and David Ascher, 2003,O'Reilly.
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, SamsPublishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy.2005.
4. Jython Essentials – SamuelePedroni and Noel Pappin.2002.O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000. (ISBN0596000278)
6. Python Tutorial by Guido Van Rossum, Fred L. Drake Jr. editor, Release2.6.4
7. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk4.0.
8. Teach Yorself Perl in 21 days by DavidTill.
9. Red Hat Enterprise Linux 4: System Administration Guide Copyright, 2005 Red HatInc.

Course Code	Course Title						Core/Elective
SPE3225ES	**Image and Video Processing**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Study fundamental concepts of Image Processing and various Image Transforms
- Learn Image Enhancement Techniques in Spatial and Frequency domain, Image Segmentation methods
- Familiarize with fundamentals of Image compression, Lossy & Lossless Compression methods.
- Define concepts of Video Processing, Image Formation models, and processing of Video signals.
- Understand general methodologies of 2 D Motion Estimation and Video coding methods.

Course Outcomes

After completing this course, the student will be able to:

1. Use different transforms for various applications like Image Enhancement, Compression etc.
2. Use Spatial and Transform techniques to Enhance the given image and to extract the features of the image.
3. Use Lossless and Lossy compression techniques for real time applications.
4. Understand the fundamental concepts of Video capturing and Three Dimensional Motion Models.
5. Understand and analyse various Motion estimation techniques.

UNIT I

Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System, Sampling and Quantization of an image, relationship between pixels

Image Transforms: 2 D- Discrete Fourier Transform, Discrete Cosine Transform (DCT), Wavelet Transforms: Continuous Wavelet Transform, Discrete Wavelet Transforms.

UNIT II

Image Processing Techniques Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering. Laplacian of Gaussian (LOG) filters.

Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region

UNIT III

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

UNIT IV

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

UNIT V

Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding, constant dependent video coding and joint shape and texture coding .MPEG and H.26X standards.

Suggested Reading:

1. Gonzaleze and Woods, *Digital Image Processing*, 3rd edition,Pearson.
2. Yao Wang, Joem Ostermann, Ya–quin Zhang, *Video processing and communication*, 1stEdition, PH Int.
3. S. Jayaraman, S.Esakkirajan, T.Veera Kumar *Digital Image Processing*, TMH,2009.
4. M. Tekalp, Digital *Video Processing*, Prentice HallInternational
5. John Woods, *Multi-dimensional Signal, Image and Video Processing and Coding* 2ndEdition, Elsevier.
6. Vipula Singh, *Digital Image Processing with MATLAB and LabVIEW*, Elsevier,2013
7. Keith Jack, *Video Demystified – A Hand Book for the Digital Engineer*, 5th Edition,Elsevier.

Course Code	Course Title						Core/Elective
SPE3226ES	**Kernel and Driver Programming**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To learn the fundamental of device driver and write simple device driver programs
- To learn the debugging technique and study the concurrency and Trace conditions
- To learn about the interrupt handling, PCI driver and USB driver
- To learn the block driver and network driver

Course Outcomes

After completing this course, the student will be able to:

1. write simple device driver programs
2. Handle interrupts and drivers
3. Measure the performance of your device driver.
4. Write programs for devices in Linux.
5. Design and implement a kernel module.

UNIT I

Introduction to Device Driver and Char Driver: Introduction to device driver - The Role of the Device Driver –Splitting the Kernel - Classes of Devices and Modules - Security Issues – Building and running modules – Setting your test system – compiling and loading - Char Drivers - Design of scull - Some Important Data Structures - Char Device Registration - open and release - scull's Memory Usage - read and write - Playing with the New Devices

UNIT II

Debugging Technique, Concurrency and Trace Conditions: Debugging technique -Concurrency and trace conditions – Pitfalls in scull - Concurrency and Its management - Semaphores and Mutexes - Completions – Spinlocks - Locking Traps - Alternatives to Locking - Advanced Char driver operations – ioctl 135 - Blocking I/O 147 - poll and select 163 - Asynchronous Notification - Seeking a Device - Access Control on a DeviceFile

UNIT III

Memory Allocation, Communicating with Hardware: Time, delays and deferred work – Allocating memory – The Real Story of kmalloc - Lookaside Caches - get_free_page and Friends - vmalloc and Friends-Per-CPU Variables - Obtaining Large Buffers - Communicating with hardware – I/O Ports and I/O Memory - Using I/O Ports - I/O Port Example - Using I/OMemory

UNIT IV

Interrupt Handling, Data Types, Pci Driver and Usb Driver: Interrupt handling - Preparing the Parallel Port - Installing an Interrupt Handler - Implementing a Handler - Top and Bottom Halves - Interrupt Sharing-Interrupt-Driven I/O - Data types in kernel – Use of Standard C Types - Assigning an Explicit Size to Data Items - Interface-Specific Types - Other Portability Issues - Linked Lists - PCI drivers - PCI Interface - PC/104 and PC/104+ - Other PC Buses - USB drivers - USB and Sysfs - USB Urbs - Writing a USB Driver - USB Transfers Without Urbs

UNIT V

LINUX Device Model, Block Driver and Network Drivers: Linux device model – K objects, K sets, and Subsystems - Low-Level Sysfs Operations - Hotplug Event Generation - Buses, Devices, and Drivers – Classes – Hotplug - Block Driver – Registration - Block Device Operations - Request Processing - Network Drivers

Suggested Reading:

1. Robert love “Linux Kernel Development” Pearson Publication, Third edition2010
2. Beck Michael et al “Linux Kernel Programming” Pearson Publication, Third edition2015
3. Mohan LalJangir “Linux kernel and device driver programming”, Laxmi Publication,2014

Course Code	Course Title						Core/Elective
SPE3227ES	**Cloud Computing**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- The student will also learn how to apply trust-based security model to real-world security problems
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures
- Students will learn the basic Cloud types and delivery models
- Develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model
- Understand Security Management in the Cloud and Privacy Issues

Course Outcomes

After completing this course, the student will be able to:

1. Identify security aspects of each cloud model
2. Develop a risk-management strategy for moving to the Cloud
3. Implement a public cloud instance using a public cloud service provider
4. Apply trust-based security model to different layer
5. Apply techniques for Security Management in the Cloud and Privacy Issues

UNIT I

Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

UNIT II

Cloud Computing Architecture: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model **Cloud Deployment Models:** Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

UNIT III

Security Issues in Cloud Computing: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security

Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

UNIT IV

Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS

Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

UNIT V

Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as- a-Cloud

Suggested Reading:

1. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton,Publication Date: November 2,2009
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765, O'Reilly Media, September2009

Course Code	Course Title						Core/Elective
SPE3228ES	**Mobile Computing**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Learn front end devices for information access and their operating systems.
- FamiliarizewithCommunicationbetweenthemobileequipmentandthebasestationtransceiver
- Learn transmission and reception of data directory service
- Formulate network routing
- Estimate transaction.

Course Outcomes

After completing this course, the student will be able to:

1. Explain the principles and theories of mobile computing technologies.
2. Describe the possible future of mobile computing technologies and applications.
3. Design effective mobile interfaces using human computer interaction principles.
4. Understand different Ad hoc Network Routing protocols
5. Estimate transaction.

UNIT I

Introduction: Challenges in mobile computing, coping with uncertainties, Resource poorness, bandwidth, etc. Cellular architecture, co-channel interference, frequency reuse, capacity increase by cell splitting: Evolution of mobile system: CDMA, FDMA, TDMA and GSM.

UNIT II

Mobility Management: Cellular architecture, Co-channel interference, Mobility: handoff, types of handoffs; Location management, HLR-VLR scheme, Hierarchial scheme, Predictive location management schemes, Mobile IP, Cellular IP.

UNIT III

Publishing and Accessing Data in Air: Pull and Push based data delivery models, Data dissemination by broadcast, Broadcast disks, Directory service in air, energy efficient indexing scheme for push based data delivery.

File system support for mobility: Distributed file sharing for mobility support, Coda and other storage manager for mobility support.

UNIT IV

Ad hoc Network Routing protocols: Ad hoc network routing protocols, destination sequenced distance vector algorithm, Cluster based gate way switch routing, Global state routing, fish- eye state routing, dynamic source routing, ad hoc on-demand routing, location aided routing, Zonal routingalgorithm.

UNIT V

Mobile Transaction and Commerce: Models for mobile transaction, Kangaroo and Joey transactions, Team transaction, Recovery model for mobile transactions. Electronic payment and protocols for mobile commerce.

Suggested Reading:

1. Jochen Schiller, *Mobile Communications*, 2nd edition, Pearson Education,2004.
2. Hansmann, Merk, Nicklous, Stober, *Principles of mobile Computing*, 2nd edition,Springer International Edition,2003.
3. *A Survey of Mobile transactions appeared in distributed and parallel data bases*, 16, 193-230, 2004, Kluwer AcademicPublishers.
4. S. Acharya, M. Franklin and S. Zdonik, *Balancing Push and pull for Data Broadcast*, Proceedings of the ACM SIGMOD, Tuscon, AZ, May1997.

Course Code	Course Title						Core/Elective
SPE3319ES	**SoC Design**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Understand Integration of hardware and software on a single chip
- Describe various processors
- Design of Memory for SoC
- Familiarize with Interconnection of various devices and reconfiguration
- Explore various application of system on single chip

Course Outcomes

After completing this course, the student will be able to:

1. Apply fundamental knowledge of digital logic design to modelling and analysis of low power in processor design.
2. Understand the design concepts of processor, pipelining concepts, ARM Development Tools and Interfacing ARM with Co-processors.
3. Understand the concepts of Memory Hierarchy, Cache design and Memory Management.
4. Develop an understanding of various interconnect schemes for system Development.
5. Design a simple SoC for reconfigurability/low power/ASIP/NISCetc.

UNIT I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT II

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT III

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacementat misstime, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memoryinteraction.

UNIT IV

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance-Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT V

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Suggested Reading:

1. Ricardo Reis, "*Design of System on a Chip: Devices and Components*, 1st Ed., Springer,2004.
2. Michael J. Flynn and Wayne Luk, *Computer System Design System-on-Chip*, Wiley India Pvt.Ltd.
3. Steve Furber, *ARM System on Chip Architecture*, 2nd Ed., Addison Wesley Professional,2000.
4. Jason Andrews, *Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)*, Newnes, BK andCDROM.
5. Prakash Rashinkar, Peter Paerson and Leena Singh L, *System on Chip Verification – Methodologies and Techniques*, Kluwer Academic Publishers,2001.

Course Code	Course Title						Core/Elective
SPE3303ES	**Real Time Operating Systems**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Understand concepts of OS and RTOS
- Describe UNIXOS
- Distinguish between Hard and Soft RTOS
- Analyse the concept of Embedded RTOS
- Explore VxWorks.

Course Outcomes

After completing this course, the student will be able to:

1. Describe the features of UNIX operating system and differentiate between UNIX and POSIX.
2. Differentiate between Hard and Soft Real time systems and familiarize with classical Uni-processor scheduling algorithms
3. Understand the concepts of Real time operating systems and analyse the Interprocess communication.
4. Explain the features of VxWorks and compare the commercially available RTOS's
5. Understand the debugging tools and cross development environment.

UNIT I

Brief Review of Unix Operating Systems (Unix Kernel – File system, Concepts of – Process, Concurrent Execution & Interrupts. Process Management – forks & execution. Programming with system calls, Process Scheduling. Shell programming and filters).

Portable Operating System Interface (POSIX) – IEEE Standard 1003.13 & POSIX real time profile. POSIX versus traditional Unix signals, overheads and timing predictability.

UNIT II

Hard versus Soft Real-time systems – examples, Jobs & Processors, Hard and Soft timing constraints, Hard Real-time systems, Soft Real-time systems. Classical Uni-processor Scheduling Algorithms – RMS, Preemptive EDF, Allowing for Preemptive and Exclusion Condition.

UNIT III

Concept of Embedded Operating Systems, Differences between Traditional OS and RTOS. Real time System Concepts, RTOS Kernel & Issues in Multitasking – Task Assignment, Task Priorities, Scheduling, Inter task Communication & Synchronization – Definition of Context Switching, Foreground ISRs and Background Tasks. Critical Section – Reentrant Functions, Inter process Communication (IPC) – IPC through Semaphores, Mutex, Mailboxes, Message Queues or Pipes and EventFlags.

UNIT IV

VxWorks – POSIX Real Time Extensions, timeout features, Task Creation, Semaphores (Binary, Counting), Mutex, Mailbox, Message Queues, Memory Management – Virtual to Physical Address Mapping. Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

UNIT V

Debugging Tools and Cross Development Environment – Software Logic Analyzers, ICEs. Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

Suggested Reading:

1. Jane W.S.Liu, *Real Time Systems*, Pearson Education, Asia,2001.
2. Wind River Systems, *VxWorks Programmers Guide*, Wind River SystemsInc.1997.
3. Shibu K.V., *Introduction to embedded systems*, MC Graw-Hill Inc.,1997.
4. Tanenbaum, *Modern Operating Systems*, 3rd edition, Pearson Edition,2007.
5. Jean.J. Labrosse, *MicroC/OS-II*, The CMPBooks.
6. C.M. Krishna and G. Shin, *Real Time System*, McGraw Hill International Editions,1997.

Course Code	Course Title						Core/Elective
SPE3304ES	**Programming Languages for Embedded Software**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To impart the knowledge of the Embedded Programming
- To set the required background in embedded system concepts, fundamentals of Embedded 'C'& C++ language Programming
- To Impart the knowledge of scripting languages for embedded systems'
- **Course Outcomes**

  After completing this course, the student will be able to:
- Write an embedded C application of moderate complexity.
- Develop and analyze algorithms in C++.
- Differentiate interpreted languages from compiled languages.

UNIT-I

Embedded 'C' Programming

- Bitwise operations, Dynamic memory allocation, OS services
- Linked stack and queue, Sparse matrices, Binary tree
- Interrupt handling in C, Code optimization issues
- Writing LCD drives, LED drivers, Drivers for serial port communication
- Embedded Software Development Cycle and Methods (Waterfall, Agile)

UNIT-II

CPP Programming: 'cin', 'cout', formatting and I/O manipulators, new and delete operators, Defining a class, data members and methods, 'this' pointer, constructors, destructors, friend function, dynamic memory allocation

UNIT-III

Overloading and Inheritance: Need of operator overloading, overloading the assignment, overloading using friends, type conversions, single inheritance, base and derived classes, friend classes, types of inheritance, hybrid inheritance, multiple inheritance, virtual base class, polymorphism, virtual functions,

UNIT-IV

Templates: Function template and class template, member function templates and template arguments, Exception Handling: syntax for exception handling code: try-catch-throw, Multiple Exceptions.

UNIT-V

Scripting Languages Overview of Scripting Languages – PERL, CGI, VB Script, Java Script. PERL: Operators, Statements Pattern Matching etc. Data Structures, Modules, Objects, Tied Variables, Inter process Communication Threads, Compilation & Line Interfacing.

Suggested Reading:

1. Michael J. Pont, "Embedded C", Pearson Education, 2 nd Edition, 2008
2. Randal L. Schwartz, "Learning Perl", O'Reilly Publications, 6 th Edition 2011
3. A. Michael Berman, "Data structures via C++", Oxford University Press, 2002
4. Robert Sedgewick, "Algorithms in C++", Addison Wesley Publishing Company, 1999
5. Abraham Silberschatz, Peter B, Greg Gagne, "Operating System Concepts", John Willey & Sons, 2005

Course Code	Course Title						Core/Elective
SPE3305ES	**Machine Learning**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To understand various key paradigms for machine learning approaches
- To understand the Implementation of genetic algorithms
- To gain knowledge about Q-Learning
- To create new machine learning techniques.

Course Outcomes

After completing this course, the student will be able to:

- To formulate a machine learning problem
- Develop and apply regression algorithms for finding relationships between data variables.
- Develop and apply reinforcement learning algorithms for learning to control complex systems.
- Write scientific reports on computational machine learning methods, results and conclusions.

UNIT I:

BASICS : Introduction: Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate eEliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search

UNIT II:

NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.

UNIT III:

BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV

INSTANT BASED LEARNING: K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.

UNIT V

ADVANCED LEARNING: Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning – FOCL Algorithm - Reinforcement Learning Task Learning Temporal Difference Learning

Suggested Reading:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 2010
2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995
3. Ethem Alpaydin, (2004) “Introduction to Machine Learning (Adaptive Computation and Machine Learning)”, The MIT Press
4. T. astie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer(2nd ed.), 2009

Course Code	Course Title						Core/Elective
SCC5161ES	**Research Methodology and IPR**						**Compulsory Course**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**0**

Course Objectives

To make students to

- Motivate to choose research as career
- Formulate the research problem, prepare the research design
- Identify various sources for literature review and data collection report writing
- Equip with good methods to analyse the collected data
- Know about IPR copyrights

Course Outcomes

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

1. Define research problem, review and asses the quality of literature from various sources
2. Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
3. Collect the data by various methods: observation, interview, questionnaires
4. Analyse problem by statistical techniques: ANOVA, F-test, Chi-square
5. Understand apply for patent and copyrights

UNIT - I

Research Methodology: Objectives and Motivation of Research, Types of Research, research approaches, Significance of Research, Research Methods Verses Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general. Defining the Research Problem: Selection of Research Problem, Necessity of Defining the Problem

UNIT - II

Literature Survey and Repoyt5rt writing: Importance and purpose of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Need of Review, Guidelines for Review, Record of ResearchReview.

Report writing: Meaning of interpretation, layout of research report, Types of reports, Mechanism of writing a report. **Research Proposal Preparation**: Writing a Research Proposal and Research Report, Writing Research GrantProposal.

UNIT - III

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, Steps in sample design, types of sample designs.

UNIT - IV

Data Collection and Analysis: Methods of data collection, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Importance of Parametric, non- parametric test, testing of variance of two normal populations, use of Chi-square, ANOVA, F-test, z-test

UNIT - V

Intellectual Property Rights: Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

Suggested Readings:

1. C.R Kothari, Research Methodology, Methods & Technique‖; New Age International Publishers, 2004
2. R. Ganesan, Research Methodology for Engineers‖, MJP Publishers,2011
3. Y.P.Agarwal,StatisticalMethods:Concepts,ApplicationandComputation‖,SterlingPublications Pvt. Ltd., New Delhi,2004
4. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 GogiaLawAgency
5. AjitParulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications,Macmillan India Ltd,2006

Course Code	Course Title						Core/Elective
SOE9101CE	**Cost Management of Engineering Projects**						**Open Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To apply modern software packages to conduct analysis of real world data.
- To understand the technical underpinning of engineering economic analysis.
- The ability to apply the appropriate analytical techniques to a wide variety of real world problems and datasets.
- To summarize and present the analysis results in a clear and coherent manner.

Course Outcomes

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

1. Students should be able to learn the cost concepts in decision making
2. Student should be able to do cost planning and Marginal Costing
3. Students should be able to create a database for operational control and decision making.

UNIT-I

Introduction and Overview of the Strategic Cost Management Process: Cost concepts in decision- making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision- Making.

UNIT-II

Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

UNIT-III

Cost Behavior and Profit Planning Marginal Costing: Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis.

Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in- time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.

UNIT-IV

Activity-Based Cost Management: Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT-V

Quantitative techniques for cost management: Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Suggested Readings:

1. Cost Accounting – A Managerial Emphasis, Prentice Hall of India, NewDelhi
2. Charles T. Horngren and George Foster, Advanced ManagementAccounting
3. Robert S Kaplan Anthony A. Alkinson, Management & CostAccounting

Course Code	Course Title						Core/Elective
SOE9102CS	**Business Analytics**						**Open Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- Understand the role of business analytics within an organization
- Analysedatausingstatisticalanddataminingtechniquesandunderstandrelationships between the underlying business processes of an organization
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making
- To become familiar with processes needed to develop, report, and analyse business data
- Use decision-making tools/Operations research techniques
- Mange business process using analytical and management tools
- Analyse and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.
- Student will able to understand the basic rules of research formulation and procedure for obtaining patent rights

Course Outcomes

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

1. Students will demonstrate knowledge of data analytics
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making
4. Students will demonstrate the ability to translate data into clear, action able insights

UNIT-I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT-III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT-IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New- Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without 8 Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in Embedded and collaborative business intelligence, Visual data 4 recovery, Data Storytelling and Data journalism.

Suggested Readings:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, DaraG. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, persons Education.

Course Code	Course Title						Core/Elective
SOE9103 EC**	**Embedded System Design**						**Open Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Detailed overview of important concepts of Embedded system
- Analyse PIC microcontroller, its features and programming
- Describe ARM Microcontroller architectural details and instruction set
- Understand ARM Memory management
- Learn the techniques to develop an embedded system and case studies

Course Outcomes

After completing this course, the student will be able to:

1. Understand the fundamentals of the embedded system design
2. Enumerate the instruction set of ARM Processor by studying the architecture of ARM core
3. Acquire knowledge on the serial, parallel and network communication protocols.
4. Learn the embedded system design life cycle and co-design issues.
5. List the various embedded software development tools used in the design of embedded system for various applications.

UNITI

Introduction to Embedded Systems: Overview of Embedded System Architecture, Challenges & Trends of Embedded Systems, Hardware Architecture, Software Architecture. Application areas of Embedded Systems and Categories of Embedded Systems. Embedded System Design and Co-Design issues and Design Cycle Process

UNIT II

PIC 18: Family Overview, Architecture, Instruction Set, Addressing modes. Timers, interrupts of PIC 18, Capture/Compare and PWM modules of PIC 18

UNIT III

ARM Architecture: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families. Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT IV

ARM Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instruction Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions. Exception and interrupt handling.

ARM Memory Management: Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation Access Permissions, Context Switch.

UNIT V

Embedded Software Development Tools, Host and Target Machines, Linkers/Locators for Embedded Software, Getting Embedded Software into the Target System. Debugging Techniques.

Case Studies: Design of Embedded Systems using Microcontrollers – for applications in the area of communications and automotives. (GSM/GPRS, CAN, Zigbee)

Suggested Readings:

1. Raj Kamal, Embedded Systems – Architecture, Programming and Design, 2nd Edition, TMH,2008.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM Systems Developer's Guides – Designing & Optimizing System Software, Elsevier,2008.
3. Mazidi, MCKinlay and Danny Causey, PIC Microcontrollers and Embedded Systems, Pearson Education,2007
4. David.E. Simon, An Embedded Software Primer, 1st Edition, Pearson Education,1999
5. Jonathan W. Valvano, Embedded Microcomputer Systems, Real Time Interfacing, ThomasLearning, 1999.

Course Code	Course Title						Core/Elective
SOE9104EE	**Waste to Energy**						**Open Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- To enable students to aware about the generation of energy from the waste.

Course Outcomes

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

1. Students should able to learn the Classification of waste as a fuel.
2. Students should able to learn the Manufacture of charcoal.
3. Students should able to carry out the designing of gasifiers and biomass stoves.
4. Student should able to learn the Biogas plant technology.

UNIT-I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors. Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-II

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-III

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above bio mass combustors.

UNIT-IV

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction

UNIT-V

Biochemical conversion: Anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Suggested Readings:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd.,1990.
2. Biogas Technology - A Practical Hand Book, Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd.,1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd.,1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

Course Code	Course Title						Core/Elective
SOE9105ME	**Industrial Safety**						**Open Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

- Causes for industrial accidents and preventive steps to be taken.
- Fundamental concepts of Maintenance Engineering.
- About wear and corrosion along with preventive steps to betaken
- The basic concepts and importance of fault tracing.
- The steps involved in carrying out periodic and preventive maintenance of various equipments used in industry

Course Outcomes

After completing this course, the student will be equipped with:

1. concepts of engineering systems safety
2. Identify the causes for industrial accidents and suggest preventive measures.
3. Identify the basic tools and requirements of different maintenance procedures.
4. Apply different techniques to reduce and prevent Wear and corrosion in Industry.
5. Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc.
6. Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc.

UNIT-I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety colour codes. Fire prevention and firefighting, equipment andmethods.

UNIT-II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Aircompressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept andimportance.

Suggested Readings:

1. Maintenance Engineering Handbook, Higgins &Morrow, Da InformationServices.
2. Maintenance Engineering, H. P. Garg, S. Chand andCompany.
3. Pump-hydraulic Compressors, Audels, McGraw HillPublication
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & HallLondon

Course Code	Course Title						Core/Elective
SAD9001HS	**English for Research Paper Writing**						**Audit I**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- Understand that how to improve your writing skills and level of readability
- Understand the nuances of language and vocabulary in writing a Research Paper.
- Develop the content, structure and format of writing a research paper.
- Produce original research papers without plagiarism

Course Outcomes

After completing this course, the student will be able to:

1. Interpret the nuances of research paper writing.
2. Differentiate the research paper format and citation of sources.
3. To review the research papers and articles in a scientific manner.
4. Avoid plagiarism and be able to develop their writing skills in presenting the research work.
5. Create a research paper and acquire the knowledge of how and where to publish their original research papers.

UNIT - I

Academic Writing: Meaning & Definition of a research paper– Purpose of a research paper – Scope – Benefits, Limitations – outcomes.

UNIT - II

Research Paper Format: Title – Abstract – Introduction – Discussion – Findings, Conclusion – Style of Indentation – Font size/Font types – Indexing – Citation of sources.

UNIT - III

Research Methodology: Methods (Qualitative – Quantitative) Review of Literature. Criticizing, Paraphrasing & Plagiarism.

UNIT - IV

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 - The final draft and proof reading.

UNIT - V

Research Paper Publication: Reputed Journals – National/International – ISSN No, No. of volumes, Scopus Index/UGC Journals – Free publications - Paid Journal publications – Advantages/Benefits **Presentation Skills:** Developing Persuasive Presentations, Structure of Presentation, Presentation Slides, Presentation Delivery, role of the audience, what to search and cite, how to establish credibility.

Suggested Readings:

1. C. R Kothari, Gaurav, Garg, ―Research Methodology Methods and Techniques‖, 4/e, NewAge InternationalPublishers.
2. DayR,―HowtoWriteandPublishaScientificPaper**",**CambridgeUniversityPress,2006
3. MLAHandbookforwritersofResearchPapers‖,7/e,EastWestPressPvt.Ltd,NewDelhi
4. Lauri Rozakis, Schaum's, Quick Guide to Writing Great Research Papers‖, Tata McGraw Hills Pvt. Ltd, NewDelhi.

Course Code	Course Title						Core/Elective
SAD9002CE	**Disaster Management**						**Audit I**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
- To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
- To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.

Course Outcomes

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

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 working**.**

UNIT-I

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT-II

Repercussions of Disasters and Hazards: 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-III

Disasters 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-IV

Disaster 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.

UNIT-IV

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal Book Company.
2. Sahni, Pardeep (Eds.), "Disaster Mitigation Experiences and Reflections", PHI, NewDelhi.
3. Goel S. L., "Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., NewDelhi.

Course Code	Course Title						Core/Elective
SAD9003HS	**Sanskrit for Technical Knowledge**						**Audit I**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- TomakethenoviceLearntheSanskrittodevelopthelogicinmathematics,science&othersubjects
- To explore the huge knowledge from ancient Indian literature

Course Outcomes

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

1. Develop passion towards Sanskrit language
2. Decipher the latent engineering principles from Sanskrit literature
3. Correlates the technological concepts with the ancient Sanskrit history.
4. Develop knowledge for the technological progress
5. Explore the avenue for research in engineering with aid of Sanskrit

UNIT-I

Introduction to Sanskrit Language: Sanskrit Alphabets-vowels-consonants- significance of Amarakosa- parts of Speech-Morphology-creation of new words-significance of synonyms-sandhi-samasa-sutras-active and passive Voice-Past/Present/Future Tense-Syntax-Simple Sentences (elementary treatment only)

UNIT-II

Role of Sanskrit in Basic Sciences: Brahmagupthaslemmas (second degree indeterminate equations), sum of squares of n-terms of AP- sulba, sutramor baudhayana theorem (origination of Pythagoras theorem)-value of pie-Madhava's sine and cosine theory (origination of Taylor'sseries). The measurement system-time-mass-length-temp, Matter elasticity-optics-speed of light (origination of Michaelson and Morley theory).

UNIT-III

Role of Sanskrit in Engineering-I (Civil, Mechanical, Electrical and Electronics Engineering): Building construction-soil testing-mortar-town planning-Machine definition-crucible-furnace-air blower- Generation of electricity in a cell-magnetism-Solar system-Sun: The source of energy, the earth-Pingala chandasutram (origination of digital logic system)

UNIT-IV

Role of Sanskrit in Engineering-II (Computer Science Engineering & Information Technology): Computer languages and the Sanskrit languages-computer command words and the vedic command words- analogy of pramana in memamsa with operators in computer language-sanskrit analogy of physical sequence and logical sequence, programming.

UNIT-V

Role of Sanskrit in Engineering-III (Bio-technology and Chemical Engineering): Classification of plants- plants, the living-plants have senses-classification of living creatures, Chemical laboratory location and layout- equipment-distillation vessel-kosthiyanthram

Suggested Readings:

1. M Krishnamachariar, History of Classical Sanskrit Literature, TTD Press, 1937.
2. M.R. Kale, A Higher Sanskrit Grammar: For the Use of School and College Students, MotilalBanarsidass Publishers,2015.
3. Kapail Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN- 10: 8171880649, 1994.
4. Pride of India, Samskrita Bharati Publisher, ISBN: 81-87276 27-4,2007.
5. Shri Rama Verma, Vedas the source of ultimate science, Nag publishers,2005.

Course Code	Course Title						Core/Elective
SAD9004HS	**Value Education**						**Audit I**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- Understand the need and importance of Values for self-development and for National development.
- Imbibe good human values and Morals
- Cultivate individual and National character.

Course Outcomes

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

1. Gain necessary Knowledge for self-development
2. Learn the importance of Human values and their application in day to day professional life.
3. Appreciate the need and importance of interpersonal skills for successful career and social life
4. Emphasize the role of personal and social responsibility of an individual for all-round growth.
5. Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.

UNIT-I

Human Values, Ethics and Morals: Concept of Values, Indian concept of humanism, human values; Values for self-development, Social values, individual attitudes; Work ethics, moral and non- moral behaviour, standards and principles based on religion, culture and tradition.

UNIT-II

Value Cultivation, and Self-management: Need and Importance of cultivation of values such as Sense-of Duty, Devotion to work, Self-reliance, Confidence, Concentration, Integrity & discipline, and Truthfulness.

UNIT-III

Spiritual outlook and social values: Personality and Behavior, Scientific attitude and Spiritual (soul) outlook; Cultivation of Social Values Such as Positive Thinking, Punctuality, Love & Kindness, avoiding fault finding in others, Reduction of anger, forgiveness, Dignity of labour, True friendship, Universal brotherhood and religious tolerance.

UNIT-IV

Values in Holy Books: Self-management and Good health; internal & external cleanliness, Holy books versus Blind faith, Character and Competence, Equality, Nonviolence, Humility, Role of Women.

UNIT-V

Dharma, Karma and Guna: Concept of soul; Science of Reincarnation, Character and Conduct, Concept of Dharma; Cause and Effect based Karma Theory; The qualities of Devine and Devilish; Satwic, Rajasic and Tamasic gunas.

Suggested Readings:

1. Chakroborty, S.K., Values & Ethics for organizations Theory and practice‖, Oxford University Press, New Delhi, 1998.
2. Jaya DayalGoyandaka, Srimad Bhagavad Gita with Sanskrit Text, Word Meaning and Prose Meaning‖, Gita Press, Gorakhpur,2017.

Course Code	Course Title						Core/Elective
SAD9011HS	**Constitution of India and Fundamental Rights**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective and to 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.

Course Outcomes

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

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956.

UNIT-I

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

UNIT-II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Suggested Readings:

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.

Course Code	Course Title						Core/Elective
SAD9012HS	**Pedagogy Studies**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

- To present the basic concepts of design and policies of pedagogy studies.
- To provide understanding of the abilities and dispositions with regard to teaching techniques, curriculum design and assessment practices.
- To familiarize various theories of learning and their connection to teaching practice.
- To create awareness about the practices followed by DFID, other agencies and other researchers.
- To provide understanding of critical evidence gaps that guides the professional development

Course Outcomes

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

1. Illustrate 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. Describe the role of classroom practices, curriculum and barriers to learning.
5. Understand Research gaps and learn the future directions.

UNIT-I

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

UNIT-II

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

UNIT-III

Evidence on the Effectiveness of Pedagogical Practices: Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and Practicum) and the school curriculum and guidance 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-IV

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-V

Research Gaps and Future Directions: Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment – Dissemination and research impact.

Suggested Readings:

1. Ackers J, Hardman F, Classroom Interaction in Kenyan Primary Schools, Compare, 31 (2): 245 – 261,2001.
2. Agarwal M, Curricular Reform in Schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361 – 379,2004.
3. Akyeampong K, Teacher Training in Ghana – does it count? Multisite teacher education research project (MUSTER), Country Report 1. London: DFID,2003.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J, Improving teaching and learning of Basic Maths and Reading in Africa: Does teacher Preparation count? International Journal Educational Development, 33 (3): 272- 282,2013.
5. Alexander R J, Culture and Pedagogy: International Comparisons in Primary Education, Oxford and Boston: Blackwell,2001.
6. Chavan M, Read India: A mass scale, rapid, learning to read campaign,2003.

Course Code	Course Title						Core/Elective
SAD9013HS	**Stress Management by Yoga**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

The Course will introduce the students to

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

Course Outcomes

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

1. Understand yoga and its benefits.
2. Enhance Physical strength and flexibility.
3. Learn to relax and focus.
4. Relieve physical and mental tension through asanas.
5. Improve work performance and efficiency.

UNIT -I

Meaning and Definition of Yoga - Historical perspective of Yoga - Principles of AstangaYoga by Patanjali.

UNIT - II

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

UNIT - III

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

UNIT - IV

Asanas- (5 Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar.

UNIT - V

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

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

Suggested Readings:

1. "Yogic Asanas for Group Training - Part-I", Janardhan Swami Yogabhyasi Mandal,Nagpur.
2. Swami Vivekananda, "Rajayogaor Conquering the Internal Nature", Advaita Ashrama (Publication Department),Kolkata.
3. Nagendra H.R and Nagaratna R, "Yoga Perspective in Stress Management", SwamiVivekananda Yoga Prakashan,Bangalore.

Course Code	Course Title						Core/Elective
SAD9014HS	**Personality Development Through Life Enlightenment Skills**						**Audit II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**-**

Course Objectives

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

Course Outcomes

At the end of this course, 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. Practice emotional self-regulation.
4. Develop a positive approach to work and duties.
5. Develop a versatile personality.

UNIT - I

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 - II

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

UNIT - III

Introduction to Bhagavadgeetha for Personality Development - Shrimad Bhagavadgeetha: 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 Chapter – 6: Verses 5, 13, 17, 23, 35; Chapter – 18: Verses 45, 46, 48

UNIT - IV

Statements of Basic Knowledge - Shrimad Bhagavadgeetha: Chapter 2- Verses 56, 62,68 - Chapter 12 – Verses 13, 14, 15, 16, 17, 18 - Personality of Role model from Shrimad Bhagawat Geeta.

UNIT - V

Role of Bhagavadgeetha 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.

Suggested Readings:

1. Srimad Bhagavad Gita, Swami SwarupanandaAdvaita Ashram (Publication Department),Kolkata
2. Bhartrihari's Three Satakam(Niti-sringar-vairagya), P.Gopinath, Rashtriya Sanskrit Sansthanam, NewDelhi

Course Code	Course Title						Core/Elective
SPC3251ES	**Embedded Systems Lab – I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**40**	**60**	**1**

Course Outcomes

After completing this course, the student will be able to:

1. Write programs for interfacing applications
2. Experience with a set of tools for embedded systems programming and debugging
3. Experience with implementing several embedded systems with particular focus on the interaction between multiple devices.
4. Write programs of serial communication
5. Design prototypes using microcontrollers and various analog and digital ICs

Cycle 1: Programming in 8051

1. Study of 8051 Evaluation Board Trainer kit and Keil IDE Software Tool.
2. Serial Data Transmission
3. Interface switches and LEDs
4. Interface LCD
5. Interface 4*4 matrix keyboard
6. Interface stepper motor
7. Interface 7 Segment Display usingI2C
8. ADC, DAC Interface

Cycle 2: Programming in LPC2148 ARM Processor

1. Configure and Control General Purpose I/O Pins
2. Interfacing LED & Switch Interface
3. 2*16 LCD Display
4. Serial Communication
5. I2C Interface & EEPROM Interface
6. Buzzer Interface
7. SD-MMC Card Interface

Note: all the experiments are to be carried out independently by each student with different specifications. At least 10 experiments are to be carried out.

Course Code	Course Title						Core/Elective
SPC3252ES	**IoT Lab-I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**40**	**60**	**1**

Course Outcomes

After completing this course, the student will be able to:

1. Experience ESP32/ESP8266
2. Experience with implementing several IoT applications
3. Work with different communication techniques
4. Send data to mobile application

Note: Following are some of the programs that a student should be able to write and test on an ESP32/ESP3266, but not limited to this only.

Cycle 1:

1. Use of ESP32/ESP8266 and Arduino IDE. Interface ESP32/ESP8266 with Arduino IDE.
2. Interface LED and Switch toESP32/ESP8266.
3. Flash an LED at given on time and off time cycle.
4. Interface LCD and GLCD with ESP32/ESP8266 to display text data and graphical data.

Cycle 2:

1. RTC interface with ESP32/ESP8266 to display time and date on LCD using I2Cprotocol.
2. External memory interfacing to ESP32/ESP8266 for storing data using SPI protocol.
3. Interface Bluetooth to send data from ESP32/ESP8266 to mobile application.
4. Casestudy-1

Note: All the experiments are to be carried out.

Course Code	Course Title						Core/Elective
SPC3253ES	**Embedded Systems Lab – II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**40**	**60**	**1**

Course Outcomes

After completing this course, the student will be able to:

1. Demonstrate Task Management and Inter-Task Communication
2. Demonstrate Message queues and priority inversion
3. Experience the PSOC
4. Design dynamic architectures using FPGA
5. Design arithmetic unit

Cycle 1: Real Time Operating System (RTOS):

1. Multitasking
2. Task and Button-Parallel Execution
3. Task and Multiple Interrupts – Parallel Execution
4. Message Queues
5. Priority Inversion

Cycle 2:

Part-1: Understanding PSOC

5. Study and Characterization of programmable gain amplifier(PGA)
6. On chip ADC and DAC Realization
7. LED Control and Pattern Generation

Part-2 FPGA Programming:

1. Design Simulation & Synthesis of combinational circuits / Design Simulation & synthesis of sequential circuits
2. Design VGA controller.
3. Designing UART interface on SOC platform.
4. Designing basic DSP designs like adder, multiplier,etc.;
5. Design and development of FIR filter.

Note: all the experiments are to be carried out independently by each student with different specifications. At least 10 experiments are to be carried out.

Course Code	Course Title						Core/Elective
SPC3254ES	**IoT Lab-II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**40**	**60**	**1**

Course Outcomes

After completing this course, the student will be able to:

1. Experience with implementing several IoT applications
2. Work with different communication techniques
3. Send data to GPRS application
4. Send data to webpage

Note: Following are some of the programs that a student should be able to write and test on an ESP32/ESP3266, but not limited to this only.

Cycle 1:

1. Interface Temperature and humidity sensors to ESP32/ESP8266 using ADC.
2. Interface GSM module to ESP32/ESP8266 using UART protocol.
3. Interface any sensor to ESP32/ESP8266 and send the sensor data to webpage using TCP/IP or HTTP Protocol.

Cycle 2:

1. LoRa (SX1276/78) interface with ESP32/ESP8266 to send data from transmission node to receiver node.
2. GPRS interfacing with ESP32/ESP8266.
3. Control relay using ESP32/ESP8266 and webpage/mobile app.
4. Control a light source using webpage.
5. Case study-2.

Note: All the experiments are to be carried out.

Course Code	Course Title						Core/Elective
SPC3255ES	**Seminar**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**50**	**-**	**1**

Course Outcomes

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

1. Develop the habit of referring the journals for literature review.
2. Understand the gist of the research paper.
3. Identify the potential for furthers cope.
4. Present the work in an efficient manner.
5. Write the documentation in standard format.

Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

- Introduction to the field
- Literature survey
- Consolidation of available in formation
- Summary and Conclusions
- References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10minutes.
2. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the Department.

Guidelines for awarding marks		
S. No.	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

Note:

1. The seminar presentation should be a gist of at least five research papers from **Peer-reviewed** or **UGC recognized** journals.
2. **The seminar report should be in the following order:** Background of work, literature review, techniques used, prospective deliverables, discussion on results, conclusions, critical appraisal and reference.
3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.
4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

Course Code	Course Title						Core/Elective
SPC3256ES	**Mini Project with Seminar**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**50**	**-**	**2**

Course Outcomes

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

1. Formulate a specific problem and give solution
2. Develop model/models either theoretical/practical/numerical form
3. Solve, interpret/correlate the results and discussions
4. Conclude the results obtained
5. Write the documentation in standard format

Guidelines:

- As part of the curriculum in the II- semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.
- Each student will be allotted to a faculty supervisor for mentoring.
- Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.
- Mini projects shall have inter-disciplinary/ industry relevance.
- The students can select a mathematical modeling based/Experimental investigations or Numerical modeling
- Alltheinvestigationsshouldbeclearlystatedanddocumentedwiththereasons/explanations.
- The mini-project shall contain a clear statement of the research objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and reference

Departmental committee: Supervisor and a minimum of two faculty members

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 50		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	20	Progress and Review
	05	Report
Departmental Committee	05	Relevance of the Topic
	05	PPT Preparation
	05	Presentation
	05	Question and Answers
	05	Report Preparation

Course Code	Course Title						Core/Elective
SPC3257ES	**Major Project Phase – I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**20**	**100**	**-**	**10**

Course Outcomes

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

1. Exposed to self-learning various topics.
2. Learn to survey the literature such as books, journals and contact resource persons for the selected topic of research.
3. Learn to write technical reports.
4. Develop oral and written communication skills to present.
5. Defend their work in front of technically qualified audience

Guidelines:

- The Project work will preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.
- Seminar should be based on the area in which the candidate has undertaken the dissertation work.
- The CIE shall include reviews and the preparation of report consisting of a detailed problem statement and a literature review.
- The preliminary results (if available) of the problem may also be discussed in the report.
- The work has to be presented in front of the committee consists of Chairperson-PRC, Head, Supervisor & Project coordinator from the Department.
- The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the guide and student.

Guidelines for awarding marks in CIE (Continuous Internal Evaluation): Max. Marks: 100		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	30	Project Status / Review(s)
	20	Report
Departmental Committee Head, Supervisor & Project coordinator from the department	10	Relevance of the Topic
	10	PPT Preparation
	10	Presentation
	10	Question and Answers
	10	Report Preparation

Note: The Supervisor has to assess the progress of the student regularly.

Course Code	Course Title						Core/Elective
SPC3258ES	**Major Project Phase – II (Dissertation)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**32**	**-**	**200**	**16**

Course Outcomes

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

1. Use different experimental techniques and will be able to use different software/computational /analytical tools.
2. Design and develop an experimental set up/ equipment/testing.
3. Conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
4. Either work in a research environment or in an industrial environment.
5. Conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.

Guidelines:

- It is a continuation of Major Project Phase – I started in semester - III.
- The student has to submit the report in prescribed format and also present a seminar.
- The dissertation should be presented in standard format as provided by the department.
- The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.
- The report must bring out the conclusions of the work and future scope for the study. The work has to be presented in front of the examiners panel consisting of an approved external examiner and Chairperson, PRC, Members of the PRC.
- The candidate has to be in regular contact with his/her Supervisor / Co-Supervisor

Guidelines for awarding marks in SEE (Semester End Examination): Max. Marks: 200		
Evaluation by	**Max. Marks**	**Evaluation Criteria / Parameter**
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	30	Quality of the work which may lead to publications
	10	Analytical / Programming / Experimental Skills Preparation
	10	Report preparation in a standard format
External Examiner and Chairperson, PRC, Members of the PRC	20	Power Point Presentation
	60	Quality of thesis and evaluation
	30	Innovations, application to society and Scope for future study
	20	Viva-Voce

Distinct features of model PG curriculum in Engineering and Technology (as per AICTE):

1. Standardized academic structure for all PG Programs with uniform credit distribution.
2. Advanced study of specialization through core subjects, flexible and diverse program specific electives.
3. Open electives to widen skills.
4. Enhanced engagement of industry in developing innovations and problem solutions.
5. Collaborating and interactive learning to ensure talent development.
6. Inbuilt mechanism for regular upgradation of curriculum.
7. Focus on development of advanced knowledge and specific skills required for industrial development.
8. Ensured competency development of learner.

Program Outcomes (POs)

1. Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.
2. Identify, formulate and solve engineering problems in the broad areas like System Design using Embedded platforms and tools.
3. Use different software tools in the domain of Embedded Systems Design, Analysis and Verification based on Real Time Operating System (RTOS), Programmable System on Chip (PSOC), Platform specific EDA sets, MATLAB and so on.
4. Design and conduct experiments, analyze and interpret data, imbibe programming skills for development of simulation experiments.
5. Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it.

- Sir Henry Royce, English Engineer.

Have courage to think differently, courage to invent, to travel the unexplored path, courage to discover the impossible to conquer the problems and succeed.

- APJ Abdul Kalam.

STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)

(Affiliated to Osmania University)(Accredited by NAAC with "A" Grade)
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