G. Pullaiah College of Engineering and Technology

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA (CE, CSE, ECE & EEE) | Permanently Affiliated to JNTUA)

Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

MASTER OF TECHNOLOGY

Digital Electronics & Communication Systems

ACADEMIC REGULATIONS GPCET – R24

M.Tech Regular Two Year Degree Programme
(for the batches admitted from the academic year 2024-25)

G. Pullaiah College of Engineering and Technology

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Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

Academic Regulations of M.Tech. (Full Time/Regular) Programme

(Effective for the students admitted into I year from the Academic Year 2024-25 and onwards)

G. Pullaiah College of Engineering and Technology (GPCET) offers **Two** Years (**Four** Semesters) full-time Master of Technology (M.Tech.) Degree programme, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.

The Jawaharlal Nehru Technological Institute Anantapur shall confer M. Tech. degree on candidates who are admitted to the programme and fulfill all the requirements for the award of the degree.

1. **Award of the M.Tech. Degree**

   A student will be declared eligible for the award of the M.Tech. degree if he/she fulfils the following:

   - Pursues a course of study for not less than two academic years and not more than four academic years.
   - Registers for 70 credits and secures all 70 credits.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. course and their admission stands cancelled.

3. **Programme of Study:**

   The following M.Tech. Specializations are being offered at present in different branches of Engineering and Technology.

S.No.	Discipline	Name of the Specialization	Code
01	Electrical and Electronics Engineering	Electrical Power System	07
02	Electronics and Communication Engineering	Digital Electronics & Communication Systems	38
03	Computer Science and Engineering	Computer Science and Engineering	58

4. **Eligibility for Admissions**:

   - Admission to the M. Tech Program shall be made subject to the eligibility, qualification and specialization prescribed by the A.P. State

Government/Institute from time to time.

- Admissions shall be made either on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by A.P. State Government (APPGECET) for M.Tech. programmes/an entrance test conducted by Institute/on the basis of any other exams approved by the Institute, subject to reservations as laid down by the Govt. from time to time.

5. Programme related terms:

- ***Credit:*** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

  Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit

- ***Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.
- ***Choice Based Credit System (CBCS):*** The CBCS provides choice for students to select from the prescribed courses.

6. Programme Pattern:

- Total duration of the of M.Tech. programme is two academic years
- Each academic year of study is divided into two semesters.
- Each Semester shall be of 22 weeks' duration (inclusive of Examinations), with a minimum of 90 instructional days per semester.
- The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Tech. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Tech. programme.
- The medium of instruction of the programme (including examinations and project reports) will be in English only.

All subjects/courses offered for the M.Tech. degree programme are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Core Courses	Foundational & Professional Core Courses (PC)	Includes subjects related to the
2.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the

			parent discipline which are of importance in the context of special skill development
3.	Research	Research methodology & IPR	To understand importance and process of creation of patents through research
		Technical Seminar	Ensures preparedness of students to undertake major projects/Dissertation, based on core contents related to specialization
		Cocurricular Activities	Attending conferences, scientific presentations and other scholarly activities
		Dissertation	M.Tech. Project or Major Project
4.	Audit Courses	Mandatory noncredit courses	Covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education etc.

- The college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- A faculty advisor/mentor shall be assigned to each specialization to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.
- Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Attendance Requirements:

- A student shall be eligible to appear for the external examinations if he/she acquires i) a minimum of 50% attendance in each course and ii) 75% of attendance in aggregate of all the courses.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class.
- A stipulated fee shall be payable towards condonation of shortage of attendance.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission into that semester when offered next.

- If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

8. Evaluation – Distribution and Weightage of Marks:

The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned), for a maximum of 100 marks for theory and 100 marks for practical, based on Internal Evaluation and End Semester Examination.

- There shall be five units in each of the theory subjects. For the theory subjects 60 marks will be for the End Examination and 40 marks will be for Internal Evaluation.
- Two Internal Examinations shall be conducted for 30 marks each, one in the middle of the Semester and the other immediately after the completion of instruction. First mid examination shall be conducted for I & II units of the syllabus and second mid examination for III, IV & V units. Each mid exam shall be conducted for a total duration of 120 minutes with 3 questions (without choice) each question for 10 marks. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage to the better internal exam and 20% to the other. There shall be an online examination (TWO) conducted during the respective mid examinations by the college for the remaining 10 marks with 20 objective questions.

The following pattern shall be followed in the End Examination:

i. Five questions shall be set from each of the five units with either/or type for 12 marks each.
ii. All the questions have to be answered compulsorily.
iii. Each question may consist of one, two or more bits.

- For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day-to-day performance. The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup mark of Procedure-10, Experimentation-25, Results-10, Viva- voce- 15.
- There shall be a **Technical Seminar** during I year II semester for internal evaluation of 100 marks. A student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other faculty members of the

department. The student has to secure a minimum of 50% of marks, to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same as and when supplementary examinations are conducted. The Technical seminar shall be conducted anytime during the semester as per the convenience of the Project Review Committee and students. There shall be no external examination for Technical Seminar.

- There shall be Mandatory **Audit courses** in I & II semesters for zero credits. There is no external examination for audit courses. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 40 marks every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.
- A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

In case the candidate does not secure the minimum academic requirement in any of the subjects he/she has to reappear for the Semester Examination either supplementary or regular in that subject or repeat the course when next offered or do any other specified subject as may be required.

The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the institutions and shall be produced to the committees as and when the same are asked for.

9. Credit Transfer Policy

As per Institute Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the institute shall allow up to a maximum of 40% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM.

- The Institute shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.
- The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform
- Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution
- The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the

curriculum in the offline mode.

- The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
- The institution shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester
- The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- The Institute shall ensure no overlap of SWAYAM MOOC exams with that of the Institute examination schedule. In case of delay in SWAYAM results, the Institute will re-issue the marks sheet for such students.
- Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
- The institution shall submit the following to the examination section of the Institute:
    a) List of students who have passed MOOC courses in the current semester along with the certificates of completion.
    b) Undertaking form filled by the students for credit transfer.
- The Institute shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

10. Re-registration for Improvement of Internal Evaluation Marks:

A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination

- The candidate should have completed the course work and obtained examinations results for **I, II and III** semesters.
- The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%.
- Out of the subjects the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of **three** Theory subjects for Improvement of Internal evaluation marks.
- The candidate has to re-register for the chosen subjects and fulfill the academic requirements.
- For reregistration the candidates have to apply to the Institute by paying the requisite fees before the start of the semester in which re-registration is required.
    I. For each subject, the candidate has to pay a fee equivalent to one

third of semester tuition fee along with a requisition form through the head of the department

- In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

11. Evaluation of Project/Dissertation Work:

The Project work shall be initiated at the beginning of the III Semester and the duration of the Project is of two semesters. Evaluation of Project work is for 300 marks with 200 marks for internal evaluation and 100 marks for external evaluation. Internal evaluation of the Project Work – I & Project work – II in III & IV semesters respectively shall be for 100 marks each. External evaluation of final Project work viva voce in IV semester shall be for 100 marks.

A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one faculty member of the department offering the M.Tech. programme.

A candidate is permitted to register for the Project Work in III Semester after satisfying the attendance requirement in all the subjects, both theory and laboratory (in I & II semesters).

A candidate is permitted to submit Project dissertation with the approval of PRC. The candidate has to pass all the theory, practical and other courses before submission of the Thesis.

Project work shall be carried out under the supervision of teacher in the parent department concerned.A candidate shall be permitted to work on the project in an industry/research organization on the recommendation of the Head of the Department. In such cases, one of the teachers from the department concerned would be the internal guide and an expert from the industry/ research organization concerned shall act as co-supervisor/ external guide. It is mandatory for the candidate to make full disclosure of all data/results on which they wish to base their dissertation. They cannot claim confidentiality simply because it would come into conflict with the Industry's or R&D laboratory's own interests. A certificate from the external supervisor is to be included in the dissertation of M.Tech.

Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC. The candidate shall submit status report by giving seminars in three different phases (two in III semester and one in IV semester) during the project work period. These seminar reports must be approved by the PRC before submission of the Project Thesis. After registration, a candidate must present in Project Work Review - I, in consultation with his Project Supervisor, the title, objective and plan of action of his Project work to the PRC for approval within four weeks from the commencement of III Semester. Only after obtaining the approval of

the PRC can the student initiate the project work.

- The Project Work Review - II in III semester carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work.
- A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - II. Only after successful completion of Project Work Review – II, candidate shall be permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Work Review - II shall reappear for it as and when supplementary examinations are conducted.
- The Project Work Review - III in IV semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress
    i. of the Project Work and decide whether or not eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review - III after a month.
- For the approval of PRC the candidate shall submit the draft copy of dissertation to the Head of the Department and make an oral presentation before the PRC.
- After approval from the PRC, the students are required to submit a report showing that the plagiarism is within 30%. The dissertation report will be accepted only when the plagiarism is within 30%, which shall be submitted along with the dissertation report.
- Research paper related to the Project Work shall be published in conference proceedings/UGC recognized journal. A copy of the published research paper shall be attached to the dissertation.
- After successful plagiarism check and publication of research paper, three copies of the dissertation certified by the supervisor and HOD shall be submitted to the College.
- The dissertation shall be adjudicated by an external examiner selected by the Institute. For this, the Head of the Department shall submit a panel of three examiners as submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the Principal.
- If the report of the examiner is not satisfactory, the candidate shall revise and resubmit the dissertation, in the time frame as decided by the PRC. If report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the Institute
- If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva voce exam.

- The Project Viva voce examinations shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who has adjudicated the dissertation. For Dissertation Evaluation (Viva voce) in IV Sem. there are external marks of 100 and it is evaluated by external examiner. The candidate has to secure a minimum of 50% marks in Viva voce exam.
- If he fails to fulfill the requirements as specified, he will reappear for the Project Viva voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree.

12. Credits for Co-Curricular Activities

A Student shall earn 02 credits under the head of co-curricular activities, viz., attending Conference, Scientific Presentations and Other Scholarly Activities.

Following are the guidelines for awarding Credits for Co-Curricular Activities

Name of the Activity	Maximum Credits / Activity
Participation in National Level Seminar/ Conference / Workshop /Training programs (related to the specialization of the student)	1
Participation in International Level Seminar / Conference / workshop/Training programs held outside India (related to the specialization of the student)	2
Academic Award/Research Award from State Level/National Agencies	1
Academic Award/Research Award from International Agencies	2
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	1
Research / Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	2

Note:

i) Credit shall be awarded only for the first author. Certificate of attendance and participation in a Conference/Seminar is to be submitted for awarding credit.

ii) Certificate of attendance and participation in workshops and training programs (Internal or External) is to be submitted for awarding credit. The total duration should be at least one week.

iii) Participation in any activity shall be permitted only once for acquiring required credits under co-curricular activities

13. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed: After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Letter Grade	Marks Range	Grade Point
S	91-100	10
A	81-90	9
B	70-80	8
C	60-69	7
D	55-59	6
E	50-54	5
F	<50	0
Absent	AB(Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For noncredit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

- Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.
- Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

14. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes:

Class Awarded	Percentage of Marks to be secured
First class with Distinction	>= 8
First class	>= 7 and < 8
Second class	>= 5 and < 7

15. Exit Policy:

The student shall be permitted to exit with a PG Diploma based on his/her request to the Institute through the respective institution at the end of first year subject to passing all the courses in first year.

The Institute shall resolve any issues that may arise in the implementation of this policy from time to time and shall review the policy in the light of periodic changes brought by UGC, AICTE and State government.

16. With holding of Results:

If the candidate has any case of in-discipline pending against him, the result of the candidate shall be withheld, and he will not be allowed/promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

17. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

18. General:

- The academic regulations should be read as a whole for purpose of any interpretation.
- Disciplinary action for Malpractice/improper conduct in examinations is appended.
- Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
- The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Institute.

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RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Institute.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all Institute examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all Institute examinations if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all Institute examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the

		police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Institute examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant - Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Institute examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project

		work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfil all the norms required for the award of Degree.

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G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL
(AUTONOMOUS)

M.TECH IN DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS
COURSE STRUCTURE & SYLLABI

M.Tech I Semester										
S. No.	Course codes	Course Name	Category	Hours per			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal	External	Total
1	C33801	Advanced Digital System Design	PC	3	0	0	3	40	60	100
2	C33802	Wireless Communication and Networks	PC	3	0	0	3	40	60	100
3	**Program Elective – I**		PE	3	0	0	3	40	60	100
	C33803a	Design of Fault Tolerant Systems								
	C33803b	VLSI Technology and Design								
	C33803c	SoC Architecture								
4	**Program Elective – II**		PE	3	0	0	3	40	60	100
	C33804a	Coding Theory and Techniques								
	C33804b	Optical Communication and Networks								
	C33804c	5G Communications								
5	C33805	Advanced Digital System Design Lab	PC	0	0	4	2	40	60	100
6	C33806	Wireless Communication and Networks Lab	PC	0	0	4	2	40	60	100
7	C33807	Research Methodology and IPR	MC	2	0	0	2	40	60	100
8	**Audit Course – I**		AC	2	0	0	0	40	--	40
	C33808a	English for Research paper writing								
	C33808b	Disaster Management								
	C33808c	Sanskrit for Technical Knowledge								
Total				16	0	8	18			

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL
(AUTONOMOUS)

M.TECH IN DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS
COURSE STRUCTURE & SYLLABI

M.Tech II Semester										
S.No.	Course codes	Course Name	Category	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal	External	Total
1	C33809	Network Security and Cryptography	PC	3	0	0	3	40	60	100
2	C33810	Advanced Communications and Networks	PC	3	0	0	3	40	60	100
	Program Elective – III		PE	3	0	0	3	60	40	60
3	C33811a	Embedded System Design								
	C33811b	Embedded Real Time Operating Systems								
	C33811c	Embedded Systems Protocols								
	Program Elective – IV		PE	3	0	0	3	40	60	100
4	C33812a	Cognitive Radio								
	C33812b	Image and Video Processing								
	C33812c	Adhoc and Wireless Sensor Networks								
5	C33813	Network Security and Cryptography Lab	PC	0	0	4	2	40	60	100
6	C33814	Advanced Communications and Networks Lab	PC	0	0	4	2	40	60	100
7	C33815	Technical seminar	PR	0	0	4	2	40	60	100
	Audit Course – II		AC	2	0	0	0	40	--	40
8	C33816a	Pedagogy Studies								
	C33816b	Stress Management for Yoga								
	C33816c	Personality Development through Life Enlightenment Skills								
Total				14	0	12	18			

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M.TECH IN DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS
COURSE STRUCTURE & SYLLABI

M.Tech. II YEAR (III Semester)

S.No.	Course codes	Course Name	Category	Hours per			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal	External	Total
1		**Program Elective – V**	PE	3	0	0	3	40	60	100
	C33817a	Voice and Data Networks								
	C33817b	IoT and Its Applications								
	C33817c	Artificial Intelligence and Machine Learning								
2		**Open Elective**	OE	3	0	0	3	40	60	100
	C33818a	Industrial Safety								
	C33818b	Business Analytics								
	C33818c	Waste to Energy								
3	C33819	Dissertation Phase – I	PR	0	0	20	10			
4	C33820	Co-curricular Activities					2			
		Total		6	0	20	18			

M.Tech. II YEAR (IV Semester)

S.No.	Coursecodes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	C33821	Dissertation Phase – II	PR	0	0	32	16
Total							16

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COURSE STRUCTURE & SYLLABUS

(C33801) Advanced Digital System Design

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand an overview of system design approach using programmable logic devices.
- To implement combinational logic circuit design.
- To implement sequential logic circuit design.
- To learn software tools used for design process with the help of case studies.

Course Outcomes (CO): Student will be able to

- Understand an overview of system design approach using programmable logic devices.
- Implement combinational logic circuit design.
- Implement sequential logic circuit design.
- Learn software tools used for design process with the help of case studies.

UNIT - I

Processor Arithmetic: Two's Complement Number System - Arithmetic Operations; Fixed pointNumber System; Floating Point Number system - IEEE 754 format, Basic binary codes.

UNIT - II

Combinational circuits: CMOS logic design, Static and dynamic analysis of Combinational circuits, timing hazards. Functional blocks: Decoders, Encoders, Three-state devices, Multiplexers, Parity circuits, Comparators, Adders, Subtractors, Carry look-ahead adder – timing analysis. Combinational multiplier structures.

UNIT - III

Sequential Logic - Latches and Flip-Flops, Sequential logic circuits - timing analysis (Set up and hold times), State machines - Mealy & Moore machines, Analysis, FSM design using D Flip-Flops,FSM optimization and partitioning; Synchronizers and metastability. FSM Design examples:
Vending machine, Traffic light controller, Washing machine.

UNIT - IV

Subsystem Design using Functional Blocks (1) - Design (including Timing Analysis) of differentlogical blocks of varying complexities involving mostly combinational circuits:

- ALU
- 4-bit combinational multiplier
- Barrel shifter
- Simple fixed point to floating point encoder
- Dual Priority encoder
- Cascading comparators

UNIT - V

Subsystem Design using Functional Blocks (2) - Design, (including Timing Analysis) of differentlogical blocks of different complexities involving mostly sequential circuits:

- Pattern (sequence) detector
- Programmable Up-down counter
- Round robin arbiter with 3 requesters
- Process Controller
- FIFO

Textbooks:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", Pearson Education; 6th Edition, 2018
2. John F. Wakerly, "Digital Design", Prentice Hall, 3rd Edition, 2002.

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COURSE STRUCTURE & SYLLABUS

(C33802) WIRELESS COMMUNICATIONS AND NETWORKS

Hours Per Week Hours			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To study the Channel planning for Wireless Systems
- To study the Mobile Radio Propagation
- To study the Equalization and Diversity
- To study the Wireless Networks

Course Outcomes (CO):

- Understand Cellular communication concepts
- Study the mobile radio propagation
- Study the wireless network different type of MAC protocols

UNIT - I

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations,Interference and system capacity – Co channel Interference and system capacity, Channel planningfor Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference,
Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT - II

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific
Modeling.

UNIT - III

Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagationFactors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channelRelationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading ChannelsClarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray
Rayleigh Fading Model.

UNIT - IV

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A GenericAdaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear
Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation

(MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity,
RAKE Receiver.

UNIT - V

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

Textbooks:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – GottapuSasibhushana Rao, Pearson Education, 2012.

Reference Books:

1. Wireless Digital Communications – KamiloFeher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI

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COURSE STRUCTURE & SYLLABUS

(C33803a) DESIGN OF FAULT TOLERANT SYSTEMS

Program Elective– I

Hours Per Week Hours			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To provide broad understanding of fault diagnosis and tolerant design approach.
- To illustrate the framework of test pattern generation using semi and full automatic approach.
- To acquire the knowledge of scan architectures.
- To acquire the knowledge of design of built-in-self test.

Course Outcomes (CO): Student will be able to

- Provide broad understanding of fault diagnosis and tolerant design approach.
- Illustrate the framework of test pattern generation using semi and full automatic approach.
- Acquire the knowledge of scan architectures.
- Acquire the knowledge of design of built-in-self test.

UNIT - I

Fault Tolerant Design

Basic concepts: Reliability concepts, Failures & faults, Reliability and Failure rate, Relation between reliability and mean time between failure, maintainability and availability, reliability of series, parallel and parallel-series combinational circuits.

Fault Tolerant Design

Basic concepts-static, dynamic, hybrid, triple modular redundant system (TMR), 5MR reconfiguration techniques, Data redundancy, Time redundancy and software Redundancy concepts.

UNIT - II

Self-Checking circuits & Fail safe Design

Basic concepts of self checking circuits, Design of Totally self-checking checker, Checkers using mout of n codes, Berger code, Low cost residue code.

Fail Safe Design- Strongly fault secure circuits, fail safe design of sequential circuits using partitiontheory and Berger code, totally self checking PLA design

UNIT - III

Design for Testability

Design for testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs.Design for testability by means of scan

Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architectures-full scan design, Shadow register DFT,Partial scan methods, multiple scan design, other scan designs.

UNIT - IV

Logic Built-in-self-test

BIST Basics-Memory-based BIST,BIST effectiveness, BIST types, Designing a BIST, Test Pattern Generation-Engaging TPGs, exhaustive counters, ring counters, twisted ring counter, Linear feedback shift register, Output Response Analysis-Engaging ORA's, One's counter, transition counter, parity checking, Serial LFSRs, Parallel Signature analysis, BIST architectures-BIST related terminologies, A centralised and separate Board-level BIST architecture, Built-in evaluation and selftest(BEST), Random Test socket(RTS), LSSD On-chip self test, Self –testing using MISR and SRSG, Concurrent BIST, BILBO, Enhancing coverage, RT level BIST design-CUT design,simulation and synthesis, RTS BIST insertion, Configuring the RTS BIST, incorporating

configurations in BIST, Design of STUMPS, RTS and STUMPS results.

UNIT - V

Standard IEEE Test Access Methods

Boundary Scan Basics, Boundary scan architecture- Test access port, Boundary scan registers, TAP controller, the decoder unit, select and other units, Boundary scan Test Instructions-Mandatory instructions, Board level scan chain structure-One serial scan chain, multiple-scan chain with one control test port, multiple-scan chains with one TDI, TDO but multiple TMS, Multiple-scan chain, multiple access port, RT Level boundary scan-inserting boundary scan test hardware for CUT, Two module test case, virtual boundary scan tester, Boundary Scan Description language.

Textbooks:

1. Fault Tolerant & Fault Testable Hardware Design- Parag K.Lala,PHI, 1984.
2. Digital System Test and Testable Design using HDL models and Architectures - ZainalabedinNavabi, Springer International Ed.,

Reference Books:

1. Digital Systems Testing and Testable Design-MironAbramovici, Melvin A.Breuer and Arthur D. Friedman, Jaico Books
2. Essentials of Electronic Testing- Bushnell &VishwaniD.Agarwal,Springers.
3. Design for Test for Digital IC's and Embedded Core Systems- Alfred L. Crouch, 2008

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS
(C33803b) VLSI TECHNOLOGY AND DESIGN
Program Elective– I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To familiarize with large scale integration technology.
- To expose fabrication methods, layout and design rules.
- To learn methods to improve Digital VLSI system's performance.
- To know about VLSI Design constraints.

Course Outcomes (CO):

- Familiarize with large scale integration technology.
- Expose fabrication methods, layout and design rules.
- Learn methods to improve Digital VLSI system's performance.
- Know about VLSI Design constraints.

UNIT - I

Review of Microelectronics and Introduction to MOS Technologies-

MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS &BiCMOS Circuits: Ids – Vds relationships, Threshold Voltage V_T, g_m, g_{ds} and ω_o, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT - II

Layout Design and Tools

Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.

Logic Gates & Layouts

Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistiveand Inductive interconnect delays.

UNIT - III

Combinational Logic Networks

Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT - IV

Sequential Systems

Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT - V

Floor Planning

Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

Textbooks:

1. Neil Weste, David Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2010
2. Essentials of VLSI Circuits and Systems, K. EshraghianEshraghian. D, A. Pucknell, 2005, PHI.
3. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

Reference Books:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRCPress, 2011.
2. Principals of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33803c) SoC ARCHITECTURE

Program Elective– I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the basics related to SoC architecture and different approaches related to SoCDesign.
- To select an appropriate robust processor for SoC Design
- To select an appropriate memory for SoC Design.
- To realize real time case studies

Course Outcomes (CO): Student will be able to

- Understand the basics related to SoC architecture and different approaches related to SoCDesign.
- Select an appropriated robust processor for SoC Design
- Select an appropriate memory for SoC Design.
- Realize real time case studies

UNIT - I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory &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 Microarchitecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instruction extensions, VLIW Processors, Superscalar Processors

UNIT - III

Memory Design for SOC: Overview: SOC external memory, SOC Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies forline replacement at miss time, Other Types of Cache, Split – I, and D – Caches, Multilevel Caches, SOC Memory System, Models of Simple Processor – memory interaction.

UNIT - IV

Interconnect, Customization and Configurability: Interconnect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bustransactions and contention time.

SOC Customization: An overview, Customizing Instruction Processor, Reconfigurable 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.

Textbooks:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt.Ltd.
2. ARM System on Chip Architecture – Steve Furber, 2ndEdition, 2000, Addison Wesley Professional.

Reference Books:
1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (EmbeddedTechnology) – Jason Andrews – Newnes, BK and CDROM. 3. System on Chip Verification – Methodologies and Techniques –PrakashRashinkar, PeterPaterson and Leena Singh L, 2001, Kluwer Academic Publishers

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33804a) CODING THEORY AND TECHNIQUES

Program Elective– II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To learn the measurement of information and errors.
- To obtain knowledge in designing Linear Block Codes and Cyclic codes.
- To construct tree and trellies diagrams for convolution codes
- To design the Turbo codes and Space time codes and also their applications

Course Outcomes (CO):

- Learning the measurement of information and errors.
- Obtain knowledge in designing Linear Block Codes and Cyclic codes.
- Construct tree and trellies diagrams for convolution codes
- Design the Turbo codes and Space time codes and also their applications

UNIT - I

Coding for Reliable Digital Transmission and storage: Mathematical model of Information,Alogarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II

Cyclic Codes:Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT - III

Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes.Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT - IV

Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V

Space-Time Codes: Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by

Linear Dispersion Codes.
Textbooks:
1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr,Prentice Hall, Inc. 2. Error Correcting Coding Theory-Man Young Rhee, McGraw-Hill, 1989.
Reference Books:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE. 2. Digital Communications- John G. Proakis, 5th ed. TMH, 2008. 3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K. Moon, WileyIndia, 2006. 4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, TMH, 2009

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COURSE STRUCTURE & SYLLABUS

(C33804b) OPTICALCOMMUNICATIONSANDNETWORKS

Program Elective– II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the concept and structures of optical fibers.
- To study about the photo sources and detectors in digital and analog domains.
- To learn various network topologies and protocols
- To study about performance measurement and monitoring of optical communicationsystems.

Course Outcomes (CO):

- Understand the concept and structures of optical fibers.
- Study about the photo sources and detectors in digital and analog domains.
- Learn various network topologies and protocols
- Study about performance measurement and monitoring of optical communication systems.

UNIT - I

Optical Fibers: Structures, waveguiding and Fabrication: Nature of Light, Basic optical laws and definitions, Single mode fibers, Graded index fiber structure, Attenuation, Signal Dispersion in fibers.
Optical Sources- LEDs, Laser Diodes, Line Coding.

UNIT - II

Photo detectors: Photo detector Noise, Detector Response Time, Avalanche Multiplication Noise.
Optical Receiver Operation: Fundamental receiver operation, Digital receiver performance, Eye diagrams.
WDM Concepts and Components: Passive optical Couplers, Isolators and Circulators

UNIT - III

Digital Links: Point to point links, power penalties, error control, Coherent detection, Differential Quadrature Phase Shift Keying.
Analog Links: Carrier to noise ration, Multichannel Transmission Techniques, RF over Fiber, Radioover fiber links, Microwave Photonics.

UNIT - IV

Optical Networks: Network Concepts, Network Topologies, SONET/SDH, High speed lightwavelinks, Optical add/ Drop Multiplexing, Optical Switching, WDM Network, Passive Optical Networks, IP Over DWDM, Optical Ethernet, Mitigation of Transmission Impairments

UNIT - V

Performance Measurement and Monitoring: Measurement standards, Basic Test Equipment,Optical power measurement, Optical fiber characterization, Eye diagram tests, optical time domain reflectometer, optical performance monitoring, optical fiber system performance measurements.

Textbooks:

1. Gerd Keiser, “Optical Fiber Communications”, 5th Edition, Mc Graw Hill.
2. Rajeev Ramaswamy and Kumar N Sivarajan, “Optical Networks: A Practical Perspective”, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An imprint of Elsevier).

Reference Books:

1. John. M. Senior, “Optical Fiber Communications: Principles and Practice”, 2nd Ed, 2000, PE.
2. Harold Kolimbris, “Fiber Optic Communication”, 2nd Ed, 2004, PEI
3. Uyless Black, “Optical Networks: Third Generation Transport Systems”, 2nd Ed, 2009, PEI
4. Govind Agarwal, “Optical Fiber Communications”, 2nd Ed, 2004, TMH.
5. S. C. Gupta, “Optical Fiber Communications and its Applications”, 2004, PH

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33804b) 5G COMMUNICATIONS

Program Elective– II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand 5G Technology advances and their benefits
- To learn the key RF, PHY, MAC and air interface changes required to support 5G
- To acquire knowledge on Device to device communication and millimeter wave communication
- To explore implementation options for 5G

Course Outcomes (CO):

- Understand 5G Technology advances and their benefits
- Learn the key RF, PHY, MAC and air interface changes required to support 5G
- Acquire knowledge on Device to device communication and millimeter wave communication
- Explore implementation options for 5G

UNIT - I

Overview of 5G Broadband Wireless Communications:

Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G,Spectrum Analysis and Sharing for 5G.

UNIT - II

The 5G wireless Propagation Channels:

Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.

UNIT - III

Transmission and Design Techniques for 5G:

Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), nonorthogonal multiple accesses (NOMA).

UNIT - IV

Device-to-Device (D2D) and Machine-to-Machine (M2M) type Communications

Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multihop and multi-operator D2D communications.

UNIT - V

Millimeter-wave Communications

Spectrum regulations, deployment scenarios, beamforming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, PilotContamination, Spatial Modulation (SM).

Textbooks:

1. Martin Sauter "From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband", Wiley-Blackwell.
2. AfifOsseiran, Jose.F.Monserrat, Patrick Marsch, "Fundamentals of 5G Mobile Networks" , Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, "New Directions in

Wireless Communication Systems from Mobile to 5G", CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock "Millimeter Wave Wireless Communications", Prentice Hall Communications.

Reference Books:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. Amitabha Ghosh and RapeepatRatasuk "Essentials of LTE and LTE-A", Cambridge University Pres

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COURSE STRUCTURE & SYLLABUS

(C33805) ADVANCED DIGITAL SYSTEM DESIGN LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	4	68	0	0	2	40	60	100

Course Objectives:

- To familiarize the HDL simulator / synthesis tool
- To design and implement given combinational circuit on FPGA device
- To design and implement given sequential circuit on FPGA device

Course Outcomes (CO):

- Familiarize the HDL simulator / synthesis tool
- Design and implement given combinational circuit on FPGA device
- Design and implement given sequential circuit on FPGA device

List of Experiments:

Student has to design ANY TWELVE experiments of his/her user defined library componentsby using and standard HDL simulator / Synthesis tool for target FPGA device.

1. HDL code to realize all the logic gates
2. Design and Simulation of adder, Serial Binary Adder, Multi Precession Adder, Carry
3. Look Ahead Adder.
4. Design of 2-to-4 decoder
5. Design of 8-to-3 encoder (without and with parity)
6. Design of 8-to-1 multiplexer
7. Design of 4 bit binary to gray converter
8. Design of Multiplexer/ Demultiplexer, comparator
9. Design of Full adder using 3 modeling styles
10. Design of flip flops: SR, D, JK, T
11. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
12. Design of a N- bit Register of Serial- in Serial –out, Serial in parallel out, Parallel in
13. Serial out and Parallel in Parallel Out.
14. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).
15. Design of 4- Bit Multiplier, Divider.
16. Design of ALU to Perform – ADD, SUB, AND-OR, 1's and 2's Compliment,
17. Multiplication, and Division.
18. Design of Finite State Machine.
19. Implementing the above designs on Xilinx/Altera/Cypress/equivalent based FPGA/CPLD kits.

Software Requirements:

Xilinx Vivado / Int

Hardware Requirements:

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33806) WIRELESS COMMUNICATIONS AND NETWORKS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	4	68	0	0	2	40	60	100

Course Objectives:

- To understand concepts of GSM/CDMA technologies
- To implement signal processing algorithms for the given specifications
- To implement wireless communication algorithms for the given specifications

Course Outcomes (CO):

- Understand concepts of GSM/CDMA technologies
- Implement signal processing algorithms for the given specifications
- Implement wireless communication algorithms for the given specifications

List of Experiments:

Student has to design ANY TWELVE experiments of his/her user defined library componentsby using and standard HDL simulator / Synthesis tool for target FPGA device.

1. Implementation of Convolutional Encoder and Decoder.
2. Simulation of the following Outdoor Path loss propagation models using MATLAB.
   a. Free Space Propagation model
   b. Okumura model
   c. Hata model
3. Simulation of Adaptive Linear Equalizer using MAT LAB software.
4. Measurement of call blocking probability for GSM &CDMA networks using Netsim software.
5. Study of GSM handset for various signalling and fault insertion techniques (Major GSM handset sections: clock, SIM card, charging, LCD module, Keyboard, User interface).
6. Study of transmitter and receiver section in mobile handset and measure frequency
7. band signal and GMSK modulating signal.
8. Simulation of RAKE Receiver for CDMA communication using MAT LAB software.
9. Simulate and test various types of PN codes, chip rate, spreading factor and processing gain on performance of DSSS in CDMA.
10. Simulate and test the 3G Network system features using GSM AT Commands. (Features of 3G Communication system: Transmission of voice, video calls, SMS, MMS,TCP/IP,HTTP,GPS)
11. Modelling of communication system using Simulink.

Software Requirements:

MATLAB, NetSim

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33807) RESEARCH METHODOLOGY AND IPR

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	2	40	60	100

Course Objectives:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

Course Outcomes (CO): Student will be able to

- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

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

UNIT - II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Textbooks:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science &engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. anjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33809) NETWORK SECURITY AND CRYPTOGRAPHY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To identify and utilize different forms of cryptography techniques.
- To incorporate authentication and security in the network applications.
- To distinguish among different types of threats to the system and handle the same.

Course Outcomes (CO):

- Identify and utilize different forms of cryptography techniques.
- Incorporate authentication and security in the network applications.
- Distinguish among different types of threats to the system and handle the same.

UNIT - I

Security: Need, security services, Attacks, OSI Security Architecture, one-time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transpositionciphers, Cryptanalysis of Classical Encryption Techniques.

UNIT - II

Number Theory: Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

UNIT - III

Private-Key (Symmetric) Cryptography: Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

UNIT - IV

Public-Key (Asymmetric) Cryptography: RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

UNIT - V

Authentication and System Security: IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer, Secure Electronic Transaction Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Trusted Systems.

Textbooks:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2ND Edition.

Reference Books:

1. Christopher M. King, ErtemOsmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,

2. Stephen Northcutt, LenyZeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, “Inside Network Perimeter Security”, Pearson Education, 2 ndEdition
3. Richard Bejtlich, “The Practice of Network Security Monitoring: Understanding Incident Detection and Response”, William Pollock Publisher, 2013.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33810) ADVANCED COMMUNICATIONS AND NETWORKS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand about various spread spectrum communication techniques.
- To understand about different aspects related to OFDM.
- To learn about concepts of MIMO systems
- To understand various protocols used in wireless networks

Course Outcomes (CO):

Student will be able to

- Understand about various spread spectrum communication techniques.
- Understand about different aspects related to OFDM.
- Learn about concepts of MIMO systems
- Understand various protocols used in wireless networks

UNIT - I

Spread Spectrum Communications: Spreading sequences- Properties of Spreading Sequences, Pseudo-noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal VariableSpreading Factor Sequences, Barker Sequence, Complementary Codes

Direct sequence spread spectrum: DS-CDMA Model, Conventional receiver, Rake Receiver, Synchronization in CDMA, Power Control, Soft handoff, Multiuser detection – Optimum multiuser detector, Liner multiuser detection.

UNIT - II

Orthogonal Frequency Division Multiplexing: Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Window in OFDM Signal and Spectrum, Synchronization in OFDM, Pilot Insert in OFDM Transmission and Channel Estimation, Amplitude Limitations in OFDM, FFT Point Selection Constraints in OFDM, CDMA vs OFDM, Hybrid OFDM.

UNIT - III

MIMO Systems: Introduction, Space Diversity and System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond, MIMO-OFDM

UNIT - IV

Wireless LANs/IEEE 802.11x: Introduction to IEEE802.11x Technologies, Evolution of wirelessLANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing Wireless Technologies, Typical WLAN Hardware

UNIT - V
Wireless PANs/IEEE 802.15x: Introduction to IEEE 802.15x Technologies: Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards **Broad Band Wireless MANs/IEEE 802.16x:** Introduction to WMAN/IEEE 802.16x Technology,
IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical LayerDetails, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.
Textbooks:
1. Gary J. Mullett, "Introduction to Wireless Telecommunications Systems and Networks", CENGAGE 2. UpenaDalal, "Wireless Communication", Oxford University Press, 2009
Reference Books:
1. Ke-Lin Du & M N S Swamy, "Wireless Communication System", Cambridge University Press, 2010 2. GottapuSasibhusan Rao, "Mobile Cellular Communication", 1st Edition, Pearson Education, 2012

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33811a) EMBEDDED SYSTEMS DESIGN

Program Elective– III

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To differentiate between a General purpose and an Embedded System.
- To provide knowledge on the building blocks of Embedded System.
- To understand the requirement of Embedded firmware and its role in API.

Course Outcomes (CO): Student will be able to

- Expected to differentiate the design requirements between General Purpose and EmbeddedSystems.
- Expected to acquire the knowledge of firmware design principles.
- Expected to understand the role of Real Time Operating System in Embedded Design.
- To acquire the knowledge and experience of task level Communication in any Embedded System.

UNIT - I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems,
Characteristics and Quality Attributes of Embedded Systems.

UNIT - II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM,Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External CommunicationInterfaces. DDR , Flash, NVRAM

UNIT - III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT - IV

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems,Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT - V

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Textbooks:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

Reference Books:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33811b) EMBEDDED REAL TIME OPERATING SYSTEMS

Program Elective– III

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To provide broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.
- To use the real time operating system concepts.

Course Outcomes (CO): Student will be able to

- Acquire knowledge on Real Time features of UNIX and LINUX.
- Understand the basic building blocks of Real Time Operating Systems in terms of scheduling, context switching and ISR.
- Understand on Real Time applications using Real Time Linux, ucos2, VX works, Embedded Linux.

UNIT - I

Introduction

Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read,write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS,defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency.

Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

UNIT - III

Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/OConcepts, I/O Subsystem.

UNIT - IV

Exceptions, Interrupts and Timers

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - V

Case Studies of RTOS

RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

Textbooks:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011.

Reference Books:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal,TMH, 2007.
2. Advanced UNIX Programming, Richard Stevens.
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33811c) EMBEDDED SYSTEMS PROTOCOLS

Program Elective– III

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To acquire knowledge on communication protocols of connecting Embedded Systems.
- To understand the design parameters of USB and CAN bus protocols.
- To understand the design issues of Ethernet in Embedded networks.
- To acquire the knowledge of wireless protocols in Embedded domain.

Course Outcomes (CO): Student will be able to

- Acquire knowledge on communication protocols of connecting Embedded Systems.
- Understand the design parameters of USB and CAN bus protocols.
- Understand the design issues of Ethernet in Embedded networks.
- Acquire the knowledge of wireless protocols in Embedded domain.

UNIT - I

Embedded Communication Protocols

Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT - II

USB and CAN Bus

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing –PIC microcontroller CAN Interface –A simple application with CAN.

UNIT - III

Ethernet Basics

Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables,Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT - IV

Embedded Ethernet

Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure.

UNIT - V

Wireless Embedded Networking

Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing –Data Centric routing.

Textbooks:

1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002.
2. Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan

Axelson, Penram Publications, 1996.

Reference Books:

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series - Dogan Ibrahim, Elsevier 2008.
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
3. Networking Wireless Sensors - BhaskarKrishnamachari, Cambridge press 2005.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33812a) COGNITIVE RADIO

Program Elective– IV

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the fundamental concepts of cognitive radio networks.
- To develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.
- To understand technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
- To understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimization techniques for better spectrum exploitation.

Course Outcomes (CO):

Students will be able to

- Understand the fundamental concepts of cognitive radio networks.
- Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.
- Understand technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
- Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimization techniques for better spectrum exploitation.

UNIT - I

Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

UNIT - II

Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing,geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

UNIT - III

Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

UNIT - IV

Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

UNIT - V

Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), and classification of auctions (single auctions, double auctions, concurrent, sequential). Research

Challenges in Cognitive Radio: Network layer and transport layer issues, cross layer design forcognitive radio networks.

Textbooks:
1. Ekram Hossain, DusitNiyato, Zhu Han, "Dynamic Spectrum Access and Management in Cognitive Radio Networks", Cambridge University Press, 2009. 2. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive radio networks", John Wiley & Sons Ltd., 2009.
Reference Books:
1. Bruce Fette, "Cognitive radio technology", Elsevier, 2nd edition, 2009. 2. HuseyinArslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer, 2007. 3. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, "Optimizing Wireless Communication Systems" Springer, 2009. 4. Linda Doyle, "Essentials of Cognitive Radio", Cambridge University Press, 2009

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33812b) IMAGE AND VIDEO PROCESSING

Program Elective– IV

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the quality improvement methods of Image.
- To study the basic digital image and video filter operations.
- To understand the fundamentals of Image Compression.
- To understand the Representation of video, principles and methods of motion estimation.

Course Outcomes (CO):

Student will be able to

- Understand the quality improvement methods of Image.
- Study the basic digital image and video filter operations.
- Understand the fundamentals of Image Compression.
- Understand the Representation of video, principles and methods of motion estimation.

UNIT - I

Fundamentals of Image Processing and Image Transforms

Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

Image Segmentation

Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT - II

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.

UNIT - III

Image Compression

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

UNIT - IV

Basic Steps 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

2-D 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.

Textbooks:
1. Digital Image Processing – Gonzaleze and Woods, 4rd Ed., Pearson, 2018. 2. Digital Video Processing – M. Tekalp, Prentice Hall International
Reference Books:
1. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang. 1st Ed., PH Int. 2. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar –TMH, 2009

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33812c) ADHOC AND WIRELESS SENSOR NETWORKS

Program Elective– IV

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the various wireless networks
- To analyze MAC, routing and transport layer protocols
- To learn about the concepts of wireless sensor networks

Course Outcomes (CO):

Students will be able to

- Understand the various wireless networks
- Analyze MAC, routing and transport layer protocols
- Learn about the concepts of wireless sensor networks

UNIT - I

Wireless LANs and PANs: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.

AD HOC WIRELESS NETWORKS: Introduction, Issues in Ad Hoc Wireless Networks

UNIT - II

MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT - III

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient FloodingMechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT - IV

Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other TransportLayer Protocol for Ad Hoc Wireless Networks.

UNIT - V

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

Textbooks:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B. S. Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – JagannathanSarangapani, CRC Press.

Reference Books:

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C. K. Toh, 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33813) NETWORK SECURITY AND CRYPTOGRAPHY LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	4	68	0	0	2	40	60	100

Course Objectives:

- To familiarize the concepts of network security and cryptographic algorithms
- To implement the network security and cryptographic algorithms for given specifications

Course Outcomes (CO):

- Familiarize the concepts of network security and cryptographic algorithms
- Implement the network security and cryptographic algorithms for given specifications.

List of Experiments:

1. Write a program to perform encryption and decryption using substitution and transpositioncipher.
2. Write a program to implement DES algorithm logic
3. Write a program for evaluation of AES
4. Write a program for evaluation Triple DES
5. Write a program to implement Blowfish algorithm logic
6. Write a program to implement RSA algorithm logic
7. Implement Diffie-Hellman key exchange mechanism using html
8. Write a program to implement Euclid algorithm
9. Calculate the message digest of a text using SHA-1 algorithm
10. Implement the signature scheme digital signature standard
11. Implement electronic mail security
12. Case study on web security requirement

Software Requirements:

C/C++/Java/Python

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COURSE STRUCTURE & SYLLABUS

(C33814) ADVANCED COMMUNICATIONS AND NETWORKS LAB

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	4	68	0	0	2	40	60	100

Course Objectives:

- To implement digital filters for the given specifications
- To implement modulation schemes for the given specifications

Course Outcomes (CO):

Student will be able to

- Implement digital filters for the given specifications
- Implement modulation schemes for the given specifications

List of Experiments:

Student has to do minimum **TWELVE** experiments in the given list.

1. Implementation of Matched Filters.
2. Optimum receiver for the AWGN channel.
3. Design FIR (LP/HP/BP) filter using Window method.
4. Measurement of effect of Inter Symbol Interference.
5. Generation of constant envelope PSK signal wave form for different values of M.
6. Simulation of PSK system with M=4
7. Simulation of DPSK system with M=4
8. Design of FSK system
9. Simulation of correlation type demodulation for FSK signal
10. BPSK Modulation and Demodulation techniques
11. QPSK Modulation and Demodulation techniques
12. DQPSK Modulation and Demodulation techniques
13. 8-QAM Modulation and Demodulation techniques
14. DQAM Modulation and Demodulation techniques
15. Verification of Decimation and Interpolation of a given signal
16. Power spectrum estimation using AR model

Software Requirements:

MATLAB

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COURSE STRUCTURE & SYLLABUS

(C33817a) VOICE AND DATA NETWORKS

Program Elective– V

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To understand the protocols, algorithms, trade-offs rationale in voice and data networks.
- To understand the routing, transport, DNS resolutions in voice and data networks.
- To learn the network extensions and next generation architectures.

Course Outcomes (CO):

Students will be able to

- Understand the protocols, algorithms, trade-offs rationale in voice and data networks.
- Understand the routing, transport, DNS resolutions in voice and data networks.
- Learn the network extensions and next generation architectures.

UNIT - I

Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks.

UNIT - II

Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wiredand wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing.

UNIT - III

Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.

UNIT - IV

Queuing Models of Networks, Traffic Models, Little's Theorem, Markov chains, M/M/1 and otherMarkov systems, Multiple Access Protocols, Aloha System, Carrier Sensing, Examples of Local area networks

UNIT - V

Inter-networking, Bridging, Global Internet, IP protocol and addressing, Sub netting, Classless Inter domain Routing (CIDR), IP address lookup, Routing in Internet. End to End Protocols, TCP and UDP. Congestion Control, Additive Increase/Multiplicative Decrease, Slow Start, Fast Retransmit/ Fast Recovery: Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.

Textbooks:

1. D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, Prentice Hall, 1992.
2. L. Peterson and B. S. Davie, “Computer Networks: A Systems Approach”,5th Edition, Morgan

Reference Books:

1. Kumar, D. Manjunath and J. Kuri, “Communication Networking: An analytical approach”, 1st Edition, Morgan Kaufman, 2004.
2. Walrand, “Communications Network: A First Course”, 2nd Edition, McGraw Hill, 2002.
3. Leonard Kleinrock, “Queueing Systems, Volume I: Theory”, 1st Edition, John Wiley and Sons, 1975.

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COURSE STRUCTURE & SYLLABUS

(C33817b) IOT AND ITS APPLICATIONS

Program Elective– V

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To apply the Knowledge in IOT Technologies and Data management.
- To determine the values chains Perspective of M2M to IOT.
- To implement the state of the Architecture of an IOT.
- To compare IOT Applications in Industrial & real world.
- To demonstrate knowledge and understand the security and ethical issues of an IOT.

Course Outcomes (CO): Student will be able to

- Apply the Knowledge in IOT Technologies and Data management.
- Determine the values chains Perspective of M2M to IOT.
- Implement the state of the Architecture of an IOT.
- Compare IOT Applications in Industrial & real world.
- Demonstrate knowledge and understand the security and ethical issues of an IOT.

UNIT - I

Fundamentals of IoT: Evolution of Internet of Things, Enabling Technologies, IoT Architectures, one M2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT - II

IoT Protocols: IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT - III

Design and Development: Design Methodology, Embedded computing logic, Microcontroller,System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

UNIT - IV

Data Analytics and Supporting Services: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

UNIT - V

Case Studies/Industrial Applications: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino).

Textbooks:
1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, CiscoPress, 2017.
2. Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, Universities Press,2015
Reference Books:
1. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2). 2. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014. 3. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.

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COURSE STRUCTURE & SYLLABUS

(C33817c) ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (Program Elective–V)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	51	0	0	3	40	60	100

Course Objectives:

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic searchalong with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural. Language Processing

Course Outcomes (CO): Student will be able to

- Possess the ability to formulate an efficient problem space for a problem expressed in English.
- Possess the ability to select a search algorithm for a problem and characterize its time andspace complexities.
- Possess the skill for representing knowledge using the appropriate technique.
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.

UNIT - I

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. Problem Solving – State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning

UNIT - II

Logic Concepts and Logic Programming

Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, ExtendedSemantic Networks for KR, Knowledge Representation using Frames.

UNIT - III

Expert System and Applications

Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure – Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

UNIT - IV

Machine-Learning Paradigms

Introduction. Machine Learning Systems.Supervised and Unsupervised Learning. Inductive Learning. Learning Decision Trees (Text Book 2), Deductive Learning. Clustering, Support Vector Machines. Artificial Neural Networks: Introduction, Artificial Neural Networks, Single- Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial- Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

UNIT - V
Advanced Knowledge Representation Techniques Case Grammars, Semantic Web Natural Language Processing: Introduction, Sentence Analysis, Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal NetworkingKnowledge
Textbooks:
1. Saroj Kaushik. Artificial Intelligence. Cengage Learning, 2011. 2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.
Reference Books:
1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.

AUDIT COURSE-I

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33808a) ENGLISH FOR RESEARCH PAPER WRITING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40	--	40

Course Objectives: This course will enable students:

- Understand the essentials of writing skills and their level of readability
- Learn about what to write in each section
- Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO): Student will be able to

- Understand the significance of writing skills and the level of readability
- Analyze and write title, abstract, different sections in research paper
- Develop the skills needed while writing a research paper

UNIT - I

Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breakingup Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

UNIT - II

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

UNIT - III

Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

UNIT - IV

Key skills needed for writing a Title, Abstract, and Introduction

UNIT - V

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions

Suggested Reading

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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COURSE STRUCTURE & SYLLABUS

(C33808b) DISASTER MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40	--	40

Course Objectives: This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Criticallyunderstandthestrengthsandweaknessesofdisastermanagementapproaches,planningand programming in different countries, particularly their home country or the countries they work in

UNIT - I

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

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

UNIT - 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

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV

Risk Assessment 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.

UNIT - V

Disaster Mitigation:

Meaning,ConceptandStrategiesofDisasterMitigation,EmergingTrendsInMitigation.Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading
1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies 2. "'New Royal book Company..Sahni,PardeepEt.Al.(Eds.),"DisasterMitigationExperiencesAndReflections",PrenticeHall OfIndia, New Delhi. 3. GoelS.L.,DisasterAdministrationAndManagementTextAndCaseStudies",Deep&Deep Publication Pvt. Ltd., New Delhi

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COURSE STRUCTURE & SYLLABUS

(C33808c) SANSKRIT FOR TECHNICAL KNOWLEDGE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40		40

Course Objectives: This course will enable students:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing thememory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge
- Knowledge from ancient literature

Course Outcomes (CO): Student will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science &technology can be understood
- Being a logical language will help to develop logic in students

UNIT - I

Alphabets in Sanskrit,

UNIT - II

Past/Present/Future Tense, Simple Sentences

UNIT - III

Order, Introduction of roots

UNIT - IV

Technical information about Sanskrit Literature

UNIT - V

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested Reading

1. "Abhyaspustakam" –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication
3. "India's Glorious ScientificTradition" Suresh Soni, Ocean books (P) Ltd.,New Delhi

AUDIT COURSE-II

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33816a) PEDAGOGY STUDIES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40		40

Course Objectives: This course will enable students:

- Reviewexistingevidenceonthereviewtopictoinformprogrammedesignandpolicy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Course Outcomes (CO): Student will be able to

Students will be able to understand:

- Whatpedagogicalpracticesarebeingusedbyteachersinformalandinformalclassrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in whatconditions, and with what population of learners?
- Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand guidancematerials best support effective pedagogy?

UNIT - I

Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

Research gaps and future directions: Researchdesign,Contexts,Pedagogy,Teachereducation, Curriculum and assessment, Dissemination and research impact.

Suggested Reading

1. AckersJ,HardmanF(2001)ClassroominteractioninKenyanprimaryschools,Compare, 31 (2): 245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,Journalof

3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teachereducation research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013)Improving teaching and learning of basic maths and reading in Africa: Does teacherpreparation count?International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
   Chavan M (2003)ReadIndia: A mass scale, rapid, 'learning to read'campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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COURSE STRUCTURE & SYLLABUS

(C33816b) STRESS MANAGEMENT BY YOGA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40		40

Course Objectives: This course will enable students:
• To achieve overall health of body and mind • To overcome stress
Course Outcomes (CO): Student will be able to
• Develop healthy mind in a healthy body thus improving social health also • Improve efficiency
UNIT - I
Definitions of Eight parts of yog.(Ashtanga)
UNIT - II
Yam and Niyam.
UNIT - III
Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and parigraha ii) Shaucha,santosh,tapa,swadhyay,ishwarpranidhan
UNIT - IV
Asan and Pranayam
UNIT - V
i)Various yogposes and their benefits for mind &body ii)Regularization of breathing techniques and its effects-Types of pranayam
Suggested Reading
1.'Yogic Asanas forGroupTarining-Part-I": Janardan SwamiYogabhyasiMandal, Nagpur2."Rajayogaor conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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COURSE STRUCTURE & SYLLABUS

(C33816c) PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	34	0	0	0	40		40

Course Objectives: This course will enable students:

- 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 (CO): Student will be able to

- StudyofShrimad-Bhagwad-Geetawillhelpthestudentindevelopinghispersonalityand achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

UNIT - I

Neetisatakam- Holistic development of personality

Verses-19,20,21,22(wisdom)

Verses-29,31,32(pride &heroism)

Verses-26,28,63,65(virtue)

UNIT - II

Neetisatakam- Holistic development of personality

Verses-52,53,59(dont's)

Verses-71,73,75,78(do's)

UNIT - III

Approach to day to day work and duties.

Shrimad Bhagwad Geeta: Chapter2-Verses41,47,48,

Chapter3-Verses13,21,27,35,Chapter6-Verses5,13,17,23,35,

Chapter18-Verses45,46,48.

UNIT - IV

Statements of basic knowledge.

Shrimad Bhagwad Geeta: Chapter2-Verses

56,62,68Chapter12 -Verses13,14,15,16,17,18

Personality of Role model. Shrimad Bhagwad Geeta:

UNIT - V

Chapter2-Verses 17, Chapter3-Verses

36,37,42,Chapter4-Verses18,38,39

Chapter18– Verses37,38,63

Suggested Reading

1. "SrimadBhagavadGita"bySwamiSwarupanandaAdvaitaAshram(PublicationDepartment), Kolkata
2. Bhartrihari'sThree Satakam (Niti-sringar-vairagya) by P.Gopinath, RashtriyaSanskrit Sansthanam, New Delhi.

OPEN ELECTIVE

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33818a) INDUSTRIAL SAFETY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	68	0	0	3	60	40	100

Course Objectives:

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyse industrial hazards and its risk assessment.

Course Outcomes (CO): Student will be able to

- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand the health and welfare provisions given in factories act.

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 color codes. Fire prevention and firefighting, equipment and methods.

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 andapplications, 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 treeconcept, 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. Air compressor, 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 and importance

Textbooks:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:

1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33818b) BUSINESS ANALYTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	68	0	0	3	60	40	100

Course Objectives:

- The main objective of this course is to give the student a comprehensive understanding of business analytics methods.

Course Outcomes (CO): Student will be able to

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT - I

Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst.
Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.

UNIT - II

Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, RequirementLife Cycles.

UNIT - III

Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling

UNIT - IV

Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools

UNIT - V

Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.

Textbooks:

1. Business Analysis by James Cadle et al.
2. Project Management: The Managerial Process by Erik Larson and, Clifford Gray

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

G. PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY: KURNOOL (AUTONOMOUS)

COURSE STRUCTURE & SYLLABUS

(C33818c) WASTE TO ENERGY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	68	0	0	3	60	40	100

Course Objectives:

- Introduce and explain energy from waste, classification and devices to convert waste to energy.
- To impart knowledge on biomass pyrolysis, gasification, combustion and conversion process.
- To educate on biogas properties ,bio energy system, biomass resources and their classificationand biomass energy programme in India.

Course Outcomes (CO): Student will be able to

- To know about overview of Energy to waste and classification of waste.
- To acquire knowledge on bio mass pyrolysis, gasification, combustion and conversion process in detail.
- To gain knowledge on properties of biogas, biomass resources and programmes to convertwaste to energy in India.

UNIT - I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT - II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yieldsand application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT - III

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

UNIT - IV

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 biomass combustors.

UNIT - V

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 - 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.

Textbooks:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 2018
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., TMH,2017

Reference Books:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley& Sons, 1996