SRINIVASA EDUCATIONAL SOCIETY'S

PACE INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

Approved by AICTE, UGC, New Delhi & Govt. of Andhra Pradesh | Permanently Affiliated to JNTUK, Kakinada, A.P.

ACCREDITED BY **NAAC** WITH **'A'** GRADE | ACCREDITED BY **NBA**

An ISO 9001 : 2008 Certified Institution |'A' Grade Engineering College by Government of A.P.

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DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING

MASTER OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

ACADEMIC REGULATIONS

AND

COURSE STRUCTURE & SYLLABI

(For the students admitted to

M.Tech Regular Two Years Programme from the Academic Year 2018-19

ACADEMIC REGULATIONS

For the students admitted to

M.Tech Regular Two Years Programme from the Academic Year 2018-19

ACADEMIC REGULATIONS R-18 FOR M.Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the students of M.Tech (Regular) from the Academic Year 2018-19

- **ELIGIBILITY CRITERIA FOR ADMISSION**

  The eligibility criteria for admission into M.Tech programme shall be as per the guidelines issued by the Andhra Pradesh State Council of Higher Education (APSCHE) and/or by any other competent authority.

- **PROGRAMMES OFFERED (POST GRADUATE)**

  A student shall be offered admission into any one AICTE-approved programme as given below:

S.No	PROGRAMME
01	Structural Engineering (SE)
02	Power Electronics (PE)
03	Machine Design (MD)
04	VLSI & Embedded Systems (VLSI&ES)
05	Computer Science and Engineering (CSE)

- **AWARD OF DEGREE**

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

  - **2 Year M.Tech Programme:**
    - The Student shall study a course for not less than two academic years and not more than four academic years.
    - The student shall register for 68 credits and secure all the 68 credits.
    - The students, who fail to fulfil all the academic requirements for the award of degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech Programme.

- No disciplinary action shall be in pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against any student, he/she should not be awarded with the degree.

- **MEDIUM OF INSTRUCTION**

  The medium of instruction shall be English in all academic activities.

- **MINIMUM INSTRUCTION DAYS**

  The minimum instruction days for each Semester shall be 90.

- **CATEGORIZATION OF COURSES**

  The curriculum of each programme shall contain various courses indicated in the following categories to train the students for employment, higher learning, research and entrepreneurship.

  - **Professional Core (PC):** These courses are the core courses that provide the requisitefoundation in the chosen Branch of Engineering.
  - **Professional Elective (PE):** These courses are the elective courses opted by thestudents relevant to the chosen branch of engineering that provides the requisite foundation in a specific area of specialization.
  - **Mandatory Courses (MC):** The Research Methodology andIntellectual Property Right is credit course relevant to the Research orientation.
  - **Audit Courses (AC):** English for Research Paper Writing, Personality Development through Life Enlightenment Skills are non-credit courses relevant to the value education and also for enhancing employability skills.

- **CREDIT ASSIGNMENT**

  Each course is assigned a certain number of credits based on the following criteria.

Contact hours per week			Credits
L	**T**	**P**	
1	0	0	1
0	1	0	1
0	0	2	1

- **SEMESTER-WISE DISTRIBUTION OF CREDITS**

The entire programme of study is for two academic years and is on semester pattern. The distribution of credits in each semester is as following.

Semester	Credits
I	22-24
II	22-24
III	10
IV	12
Total	**68**

- **ASSESSMENT AND EVALUATION**

The performance of a student in each course shall be evaluated based on Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) or only Continuous Internal Evaluation

S.No	Category of Course	Marks	
		CIE	SEE
1	Theory Courses	40	60
2	Laboratory Courses	40	60
3	Mandatory Courses	100	
4	Audit Courses	100	
5	Project Work Phase-I	50	--
	Project Work Phase-II	30	120

- **THEORY COURSES**
  - **Continuous Internal Evaluation (CIE):**

Mid Term Examinations (40 Marks):

There shall be two mid-term descriptive examinations of 120 minutes each. The mid-term examinations shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. In each theory course, the question paper for the mid-term descriptive examination consists of four questions. A student is required to answer all four questions for maximum 40 marks.

CIE is computed as following: Finalized internal marks can be calculated with average of two mid term examinations marks and they shall be considered for marks of 40.

9.1.2Semester End Examinations (SEE)

The semester end examinations for theory courses will be conducted covering all the units for 60 Marks. 5 Questions out of 8 Questions are to be answered of which each carries 12 Marks.

- **LABORATORY COURSES**

9.2.1 Continuous Internal Evaluation (CIE)

The continuous internal evaluation for laboratory courses is based on the following parameters:

Parameter	Marks
Day-to-day Work	20
Internal Test	10
Record	05
Viva Voce	05
Total	40

9.2.2 Semester End Examinations (SEE)

The performance of the student in laboratory courses shall be evaluated jointly by internal and external examiners for 3 hours duration as per the parameters indicated below:

Parameter	Marks
Procedure/Algorithm	10
Experimentation/Program execution	15
Observations/Calculations/Testing	15
Result/Inference	10

Viva voce	10
Total	**60**

9.3 MANDATORY COURSES (CREDIT COURSES)

Mandatory courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 50% of marks to get two credits. However, a student who securesless than 50 marks /abstains shall reappear in the subsequent semester(s).

9.4 **AUDIT COURSES (NON CREDIT COURSES)**

Audit courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 50% of marks to get a satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures"US" grade /abstains shall reappear in the subsequent semester(s).

- **Project/Dissertation Work**

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members.
- Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical upto II Semester.
- After satisfying 9.5 (ii), a candidate has to submit the project in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the project work, only after obtaining the approval from the Project Review Committee (PRC).
- If a candidate wishes to change his/her supervisor or topic of the project, he/she can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not allow the change of topic/supervisor which may lead to a major change of his/her initial

plans of project proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

- The work on the project shall be initiated at the begging of the II year and the duration of the project is two semesters.

- **Project Work (CIE) Assessment:**
- **Literature Review (CIE):**

The performance of a student in project survey shall be evaluated by PRC within 8 weeks from the beginning of III Semester based on the following parameters:

Parameter	Marks
Literature Review	10
Presentation	05
Viva Voce	05
Total	20

- **Project Implementation-I (CIE):**

The performance of a student in project implementation-I shall be evaluated at the end of III Semester. A student shall make a presentation on the project work Implementation-I before PRC. The evaluation criterion of review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	05
Viva Voce	05
Total	**30**

- **Project Implementation-II (Final) (CIE):**

The performance of a student in project implementation-II (Final) shall be evaluated within 12 Weeks from the beginning of IV Semester. A student shall

give a presentation on the final project work before PRC. The evaluation criterion of review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	05
Viva Voce	05
Total	**30**

- A candidate is permitted to submit the Project Thesis after satisfying the following conditions.
  - Successful completion of theory and practical courses.
  - Not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.
  - A student shall secure a minimum 50% of marks in CIE to award as satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures "US" grade /abstains shall reappear in the subsequent semester(s).
  - A candidate shall take approval of PRC.
- Four copies of the Project Thesis certified by the Supervisor shall be submitted to the Institute.
- The thesis shall be adjudicated by an External Examiner approved by the Principal from a panel of 4 Examiners who are eminent in the field, submitted by the Department. The Head of the Department shall coordinate and make arrangements for the conduct of Viva Voce examination.
- **Project Work Viva Voce (SEE) Assessment:**

A student shall submit a duly-certified project report to the department in a specified time. He/She shall give presentation on the project work before the board consisting of the Supervisor, the Head of the Department and the examiner who adjudicated the Thesis. The performance of the student is evaluated as per the following parameters:

Parameter	Marks

Project report	40
Innovation	30
Presentation	20
Viva Voce	20
Scope of Implementation	10
Total	**120**

- **AWARD OF LETTER GRADES**

A letter grade and grade points shall be awarded to a student based on his/her performance in Project Viva Voce (120 M) as given below.

% Marks	Marks	Letter Grade	Level
≥ 90	≥ 108	A	Outstanding
70 to <90	84 to <108	B	Excellent
50 to <70	60 to <84	C	Good
<50	<60	F	Fail
--	--	Ab	Absent

A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier. A student, who is absent for any examination shall be treated as "Failed".

If the report of the examiner is favorable, Viva-Voce examination shall be conducted by the board consisting of the Supervisor, the Head of the Department and the examiner who adjudicated the Thesis. The board shall jointly report the candidate's work as one of the following:

A: Excellent

B: Good

C: Satisfactory

D: Unsatisfactory

vi. If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva Voce examination only after three months. If he/she fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the

project and complete the project within the stipulated time after taking the approval from the PRC.

- **ATTENDANCE REQUIREMENTS**
  - •A student is eligible to write the Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
  - •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 on medical grounds.
  - •A stipulated fee shall be payable towards condonation of shortage of attendance.
  - •If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
  - •Shortage of Attendance below 65% in aggregate shall not be condoned.
  - •A student who is shortage of attendance in semester may seek re-admission into that semester when offered within one week from the date of the commencement of class work.
  - •Students whose shortage of attendance is not condoned in any semester are not eligible to write their Semester End Examination of that class.
- **MINIMUM ACADEMIC REQUIREMENTS**

  The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.
  - A student shall be deemed to have satisfied the minimum academic requirements, if he/she gains the credits allotted to each course and secures not less than a minimum 40% of marks exclusively at the Semester End Examination. However, the student should secure minimum 50% of marks in both CIE and SEE put together to be eligible for passing the course.
  - The Students, who fail to earn 68 credits as indicated in the course structure within 4 academic years from the year of admission, shall forfeit their seat in M.Tech programme and admission stands cancelled.

12. PROCEDURES FOR SEMESTER END EXAMINATIONS

- **Supplementary examinations:** There shall be supplementary examinations along withregular semester end examinations for a student to reappear in the course(s) he/she failed or not attempted.
- **Recounting:** A student, who wishes to verify the total marks obtained by him/her in anytheory course in SEE can apply for recounting in response to the notification along with the prescribed fee. The outcome of the recounting gets reflected in the results sheet and grade card.
- **Revaluation:** A student who wishes to apply for revaluation of a theory course in SEEcan submit an application along with the prescribed fee as per the notification issued.
    - If the variation in marks of the first valuation and revaluation is ≤ 15% of the total marks, then the better of the two evaluations shall be considered as final marks.
    - If the variation of marks between the first valuation and revaluation is >15% of the total marks, there shall be a third evaluation by another examiner. The average marks of two nearer evaluations shall be taken into consideration. In case of any fractional value of marks, it can be rounded off to the next integer value.
    - If a student secures a higher grade in the revaluation, that grade will be declared as the final grade. Otherwise, the original grade will remain valid.

- **AWARD OF LETTER GRADES**

  A letter grade and grade points shall be awarded to a student in each course based on his/her performance as per the 10-point grading system given below.

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 90	O	10	Outstanding
80 to <90	S	9	Excellent
70 to <80	A	8	Very Good
60 to <70	B	7	Good
50 to <60	C	6	Pass
<50	F	0	Fail
--	Ab	0	Absent

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 50	SA	-	Satisfactory

< 50	US	-	Unsatisfactory
--	Ab	-	Absent

- A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier.
- A student, who is absent from any examination shall be treated as "Failed".
- In general, a student shall not be permitted to repeat any course (s) for the sake of "Grade improvement" or "SGPA/CGPA improvement".

- **COMPUTATION OF SGPA & CGPA**
  - **Semester Grade Point Average (SGPA)**

    The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored by a student in all the courses to the sum of the number of credits of all the courses.

    $SGPA\ (S_i) = \Sigma\ (C_i \times G_i) / \Sigma C_i$

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

  - **Cumulative Grade Point Average (CGPA)**

    The CGPA is a measure of the overall cumulative performance of a student. The CGPA is calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

    $CGPA = \Sigma\ (C_i \times S_i) / \Sigma C_i$

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

  - The SGPA and CGPA are rounded off to 2 decimal points and reported in grade cards.

- **AWARD OF CLASS**

A student who satisfies the minimum requirements prescribed for the completion of a programme is eligible for the award of M.Tech degree and he/she shall be placed in one of the following four classes on a 10 point scale.

Class Awarded	**CGPA to be secured**	From the CGPA secured from 68 Credits
First Class with Distinction	≥ 7.5 with no subject failures	
First Class	≥ 6.5 with subject failures	
Second Class	≥ 5.5 to < 6.5	
Pass Class	> 5.0	

- **DISCIPLINE**

  - A student is required to observe discipline and decorum both inside and outside the college and not to indulge in any activity that may tarnish the prestige of the college. The head of the institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the college about the disciplinary action taken. In case of any serious disciplinary action, which leads to suspension or dismissal, a committee shall be constituted by head of the institution for taking final decision.
  - Those students who indulge in examination related malpractices shall be punished as per the scale of punishment notified in Annexure-I.
  - Those students involved in the illegal acts of ragging shall be punished as per the provisions of Act 26, 1997 of Govt. of Andhra Pradesh (Annexure-II).

- **REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**

  The college may revise, amend or change the regulations, curriculum, syllabus and scheme of examinations from time to time subject to decisions/recommendations of Board of Studies and the College Academic Council.

- **WITHHOLDING OF RESULTS**

If a student fails to clear dues, if any, payable to the institution or any case of indiscipline is pending against him, the result of the student will be withheld, and also the award of his/her degree shall be withheld in such cases.

- **TRANSITORY REGULATIONS**
  - •A student, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those students who have already passed the courses in the earlier semester(s) he/she is originally admitted into and substitute courses are offered in place of them as approved by the Board of Studies.
  - •In general, after transition, there will be a fitment formula approved by the competent authority in order to balance course composition and the number of credits.
  - •Students admitted by transfer from other institutions shall follow transitory regulations with suitable fitment formulae approved by the competent authority.
  - •A student who is seeking readmission shall apply in the prescribed format within one week after the commencement of the class work. However, the readmission of a student shall be approved by the competent authority.
- **COURSE CODE**

The Course Codes will be given by the departments concerned to the subject. Each course code contains 8 characters. The 8 characters for each subject will be filled as per the following description:

1	2	3	4	5	6	7	8	9

1 Character : Institute Name as '**P**"

2 Character : Post Graduation Name as '**P**"

3,4 Characters: Year of Commencement of Regulations as '**18**'

5,6 Characters: Subject/Branch Category such as

CE for Civil Engineering Courses

EE for Electrical & Electronics Engineering Courses

ME for Mechanical Engineering Courses

EC for Electronics & Communication Engineering Courses

CS for Computer Science & Engineering Courses

MC for Mandatory Courses

7 Character: Mode of Subject Learning and Evaluation such as

T for Theory Courses

L for Laboratory Courses

S for Seminar

P for Project

M for Mini Project

V for Viva Voce

E for Professional Elective Courses

O for Open Elective Courses

A for Audit Course

8,9 Characters: Serial number of the course taught by the department in that Semester such 01, 02, 03,..... etc

- **GENERAL**
  - Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
  - The academic regulations should be read as a whole for the purpose of any interpretation.
  - In case of any doubt or ambiguity in the interpretation of the above rules, decision of the competent authority is final and binding.
  - The college may change or amend academic regulations or syllabi at any time subject to approval of the competent authority and the changes or may apply the amendments made to all students with effect from the dates notified.
- **STATUTORY DECLARATION**

In case the regulations do not specify application of an appropriate rule in a unique case, the decision of the competent authority of the college shall be final.

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ANNEXURE-I

MALPRACTICE RULES

DISCIPLINARY ACTION FOR MALPRACTICE/IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper Conduct	Punishment
1 (a)	If a student possesses or tries to access any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If a student gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	If a student is found to have 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. The Hall Ticket of the candidate

		is to be cancelled.
3.	Impersonates any other candidate in connection with the examination	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the Examination (including practicalsand project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End 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 to be registered against him.
4.	If a student smuggles inside the exam hall an Answer book or additional sheet or takes out or Arranges to send out the question paper 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. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	If a student 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 the subject.
6.	If a student refuses to obey the orders of the Chief Superintendent/Controller of Examinations / 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	Such a student(s) shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are to be debarred and

	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.	forfeited their seats. In case of outsiders, they will be handed over to the police and a police case is to be registered against them.
7.	If a student leaves the exam hall taking away answer script or intentionally tears 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 examinationsof the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and Semester End Examinations. The continuation of the course by the candidate is subjected to the academic regulations in connection with forfeiture of the seat .
8.	If a student possesses 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 examinationsof the subjects of that semester. The candidate is also to be debarred and forfeited the seat.
9.	If a student of the college, who is not a candidate for the particular examination or any person not	Student shall be expelled from the examination hall and cancellation of the performance in that subject and all other

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

Malpractices identified by squad or special invigilators

- Punishments to the candidates are as per the above guidelines.
- Punishment to institutions : (if the squad reports that the college is also involved in encouraging malpractices)
    - A show cause notice shall be issued to the college.
    - Impose a suitable fine on the college.
    - Shifting the examination centre from the college to another college for a specific period of not less than one year.

ANNEXURE-II

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

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

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

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

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

AR-18 REGULATIONS M.Tech COURSE STRUCTURE

I YEAR I SEMESTER								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CST01	Advanced Data Structures& Algorithms	3	1	0	4	40	60
2	PP18CST02	Distributed Systems	3	0	0	3	40	60
3	PP18CST03	Information Security	3	0	0	3	40	60
4	PP18CST04	Advanced Networks	3	0	0	3	40	60
Professional Elective-I								
5	PP18CSE01	Mobile Computing	3	0	0	3	40	60
	PP18CSE02	Cyber Laws						
	PP18CSE03	Internet of Things						
	PP18CSE04	Big Data Analytics						
Professional Elective-II								
6	PP18CSE05	Software Project Management	3	0	0	3	40	60
	PP18CSE06	Advanced Operating Systems						
	PP18CSE07	Information Retrieval Systems						
	PP18CSE08	Mathematical Foundations of Computer Science						
7	PP18CSA01	English for Research Paper Writing	2	0	0	0	100	-
8	PP18CSL01	Advanced Data Structures & Algorithms Lab	0	0	4	2	40	60
9	PP18CSL02	Software Lab-I	0	0	4	2	40	60
Total			**20**	**1**	**8**	**23**	**420**	**480**

I YEAR II SEMESTER								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CST05	Data Science	3	1	0	4	40	60
2	PP18CST06	Object oriented Software Engineering	3	0	0	3	40	60
3	PP18CST07	Advanced Computer Architecture	3	1	0	4	40	60
4	PP18CST08	Web Technologies	3	1	0	4	40	60
Professional Elective-III			3	0	0	3	40	60
5	PP18CSE09	Cyber Security						
	PP18CSE10	Advanced Databases						
	PP18CSE11	Social Network Analysis						
	PP18CSE12	Soft Computing						
Professional Elective-IV			3	0	0	3	40	60
6	PP18CSE13	Cloud Computing						
	PP18CSE14	Bio Informatics						
	PP18CSE15	Artificial Neural Networks and Deep Learning						
	PP18CSE16	Parallel Processing						
7	PP18CSA02	Personality Development through Life Enlightenment Skills	2	0	0	0	100	-
8	PP18CSL03	Software Lab - II	0	0	4	2	40	60
Total			**20**	**3**	**4**	**23**	**380**	**420**

II YEAR - I SEMESTER								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18MCT01	Research Methodology and Intellectual Property Rights	2	0	0	2	100	-
2	PP18CSP01	Project Work Phase - I	-	-	-	8	50	-
Total			**2**	**0**	**0**	**10**	**150**	**-**
II YEAR - II SEMESTER								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CSP02	Project Work Phase - II	-	-	-	12	30	120
Total			**-**	**-**	**-**	**12**	**30**	**120**

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ADVANCED DATA STRUCTURES AND ALGORITHMS

Internal Marks: 40
Course Code: PP18CST01 **External marks: 60**

Course Prerequisites: Data Structures & Mathematics

Course Objectives:

- Student will learn about advanced data structures.
- Practice the algorithms for manipulating advanced data structures, and how to analyze the time and memory requirements of them.
- Student will master some complex searching and sorting algorithms and their data structures, advanced types of trees, basic computational geometry procedures, and graph representations and graph algorithms.
- Student will learn when and how to use techniques for developing algorithms, such as divide-and- conquer and dynamic programming.
- Student will also become skilled in algorithmic analysis and algorithm development using the latest techniques.

Course Outcomes:

- Could be able to write programs and class libraries given a specification.
- Implement various data structures.
- Implement and analyze various sorting algorithms.
- Understand abstract data types.
- Know how they are implemented in C++ programming language.

UNIT- I (11 Lectures)

Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms. Stacks and Queues: Algorithm Implementation using Linked Lists.

UNIT-II (13 Lectures)

Searching-Linear and Binary Search Methods Sorting-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. Trees- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees(Infix, prefix, postfix).Graphs-Basic Concepts, Storage Structures and Traversals.

UNIT- III (11 Lectures)

Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Double Hashing.

UNIT- IV (12 Lectures)

Priority queues- Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion, Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

UNIT –V (13 Lectures)

Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations, Insertion, Deletion and Searching. Search Trees- Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

Text Books :

- Data Structure, APseudocode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon,Cengage
- Data Structures, Algorithms and Applications in java, 2/e, SartajSahni, UniversityPress
- Data Structures And Algorithm Analysis, 2/e, Mark Allen Weiss,Pearson.

References Books :

- Data Structures And Algorithms, 3/e, Adam Drozdek,Cengage.
- C and Data Structures, A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad, S Chand &Co,2009.

Web References :

- https://www.coursera.org/specializations/data-structures-algorithms
- https://www.geeksforgeeks.org/data-structures/
- https://www.studytonight.com/data-structures/
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3	0	0	3

DISTRIBUTED SYSTEMS

Internal Marks: 40

Course Code: PP18CST02 **External marks: 60**

Course Prerequisites: Operating System

Course Objectives:

- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles.

Course Outcomes:

- Develop a familiarity with distributed file systems.
- Describe important characteristics of distributed systems and the salient architectural features of such systems.
- Describe the features and applications of important standard protocols which are used in distributed systems.
- Gaining practical experience of inter-process communication in a distributed environment

UNIT-I (9 Lectures)

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II (9 Lectures)

Interprocess Communication: Introduction, The API for the Internet Protocols- The Characteristics of Interprocess communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

UNIT-III (10 Lectures)

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV (8 Lectures)

Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Thread, Address Space, Creation of a New Process, Threads.

UNIT-V (9 Lectures)

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems:

Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

Text Books :

- Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge
- George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, Pearson Publication

Reference Books :

- "DISTRIBUTED SYSTEMS", Second edition, Andrew S.Tanenbaum, Maarten Van teen., Pearson
- "Advanced Concepts in Operating Systems",Sighal and Niranjan G.Shivaratna.

Web References :

- http://www2.imm.dtu.dk/courses/02222/Spring_2011/W1L1/Chapter_01.pdf
- https://www.scribd.com/document/39430176/01-Characterization-of- Distributed-Systems
- https://www.slideshare.net/deepakhld/interprocess-communication-40190091
- https://cs.uwaterloo.ca/~bernard/courses/cs454/3.Invocation.pdf
- http://net.pku.edu.cn/~course/cs501/2007/ppt/08Distributed_File_system.pdf
- https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_controlling_concurrency.htm

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INFORMATION SECURITY

Internal Marks: 40

Course code: PP18CST03 **External marks: 60** **Course**

Prerequisites: Networks

Course Objectives:

- Identify and prioritize information assets.
- Identify and prioritize threats to information assets.
- Define an information security strategy and architecture.
- Plan for and respond to intruders in an information system

Course Outcomes:

- Understand the classic & public key cryptosystems, hash functions.
- Identify & compare the next generation Internet protocol.
- Able to apply the security concepts on operating systems
- Chose various methods and protocols to maintain E-mail security, and web security.
- Illustrate for all the stages of Cyber & Forensic Incidents and Network Forensics

UNIT – I

Introduction (9 Lectures)

Services, Mechanisms and attacks-the OSI security architecture-Network security model classical Encryption techniques, Data Encryption Standard-Block cipher principles, Advanced Encryption Standard (AES), Principles of public key cryptosystems-The RSA algorithm-Key management -Diffie Hellman Key exchange, Authentication functions-Message authentication codes-Hash functions-Hash Algorithms (Secure Hash Algorithm)

UNIT-II

Next Generation Internet Protocol (8 Lectures)

Introduction to IPv6 – IPv6 Advanced Features –V4 and V6 header comparison – V6 Address types –Stateless auto configuration – IPv6 routing protocols – IPv4-V6 Tunneling and Translation Techniques.

UNIT-III

Operating System Security (9 Lectures)

Security in Windows and LINUX/Unix: Protection system, authorization, security analysis and vulnerabilities- The security kernel- Secure communications processor – Retrofitting security into operating systems.

UNIT-IV

Web Security (10 Lectures)

SSL/TLS Basic Protocol Plan and prepare for all stages of a Forensic Incidents and Network Forensic sol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET), Kerberos, Security Services for E-mail-attacks possible through E-mail-Pretty Good Privacy-S/MIME.

UNIT-V

Cyber & Forensics (9 Lectures)

Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy, Cyber security in Society, Security in cyber laws. Forensics Incident - Incident Response

Methodology, Forensic duplication, Forensic Analysis of File Systems, Network Forensics: Network Protocols - Email Tracing - Internet Fraud, Ethical Issues - Cybercrime.

Text Books :

- William Stallings, "Cryptography and Network Security", Pearson Education, 6th Edition, 2013, ISBN 10: 0133354695
- Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw-Hill, 2006

Reference Books :

- Trent Jaeger, Operating Systems Security, Morgan & Claypool Publishers, 2008
- Michael J.Palmer, Guide to Operating Systems Security, Thomson/Course Technology, 2004
- Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997

Web References :

- http://www.omnisecu.com/security/index.php
- https://www.tutorialspoint.com/itil/information_security_management.html
- https://www.techopedia.com/definition/25830/cia-triad-of-information-security
- https://lecturenotes.in/subject/611/cyber-security-cs
- https://searchsecurity.techtarget.com/definition/cybersecurity

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ADVANCED NETWORKS

Course Code: PP18CST04

Internal Marks: 40
External marks: 60

Course Prerequisites: Computer Networks

Course Objectives

- To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
- To debate the current trends and leading research in the computer networking area.

Course Outcomes

- To identify and discuss the concepts underlying IPv6 protocol, and their main characteristics and functionality.
- To understand the principles and functionality of mobile IP.
- To recognize the need for service integration and discuss how it can be accomplished;
- To explain and exemplify current QoS architectures and mechanisms, and the QoS support challenges in future networks.
- To understand the MANET's and Security

UNIT-I (10 Lectures)

Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets. Routing Algorithm – shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, Broadcast routing, Multicasting routing, routing for mobiles Hosts, routing in Adhoc networks-congestion control algorithms-Load shedding, Congestion control in Data gram Subnet.

UNIT-II (9 Lectures)

IPV4 Address address space, notations, classful addressing, classless addressing network addressing translation(NAT) , IPV6 Address structure address space, Internetworking need for network layer internet as a data gram, internet as connection less network. IPV4 datagram, Fragmentation, checksum, options. IPV6 Advantages, packet format, extension Headers, Transition form IPV4 to IPV6.

UNIT–III (9 Lectures)

Process to process delivery: client/server paradigm, multiplexing and demultiplexing connectionless versus connection oriented services, reliable versus reliable. UDP: well known ports for UDP, user data gram, check sum, UDP operation, and uses of UDP

TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control. Quality Of Service: flow characteristics, flow classes

UNIT –IV (8 Lectures)

Multimedia: introduction digital audio , Audio compression, streaming audio, internet radio, voice over IP, introduction to video, video compression, video on demand, the MB one the multicast back bone

UNIT –V (9 Lectures)

Emerging trends Computer Networks: Mobile Ad hoc networks: applications of Ad hoc networks, challenges and issues in MANETS,MAC layers issues, routing protocols in MANET, transport layer issues, Ad Hoc networks security. Wireless sensors networks: WSN functioning, operation system support in sensor devices, WSN Characteristics, sensor network operation, sensor Architecture: cluster management.

Text Books :

- Data communications and networking 4th edition, Behrouz A Fourzan, TMH
- Computer networks 4th edition Andrew S Tanenbaum, Pearson
- Computer networks, Mayank Dave, CENGAGE

Reference Books :

- Computer networks, A system Approach, 5thedition, Larry L Peterson and Bruce S Davie, Elsevier.

Web References :

- http://library.aceondo.net/ebooks/Computer_Science/Data_Communication_and_Networking_by_Behrouz.A.Forouzan_4th.edition.pdf
- https://www.cse.iitk.ac.in/users/dheeraj/cs425/

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MOBILE COMPUTING

(Professional Elective-I)

Internal Marks: 40

Course Code: PP18CSE01 **External marks: 60**

Course Prerequisites: Mobile Applications

Course Objectives:

- To impart fundamental concepts in the area of mobile computing.
- To provide system perspective on the converging areas of wireless networking.
- To give insights of the key components and protocols involved in Mobile network, layer, transport and application layers.
- To explore the support of World Wide Web in mobile communication.

Course Outcomes:

- Realize the basic concepts of mobile computing and wireless communication.

assess the various GSM mobile services

- Explore the characteristics of Mobile transport and application layer protocols
- Analyze the framework for wireless and mobile web access
- To Understand the wireless Protocols

UNIT-I (9 Lectures)

Emerging applications, A short history of wireless communication, A market for mobile communications. Wireless Transmission: Frequencies for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation (ASK, FSK, PSK), spread spectrum.

UNIT II (9 Lectures)

Motivation for a specialized MAC (Hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA. GSM: Mobile services, System architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, New data Services.

UNIT III (9 Lectures)

Mobile IP - Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, tunneling and encapsulation, Dynamic Host Configuration Protocol(DHCP), Properties and Applications of a MANETs: Routing – DSDV, DSR.

UNIT IV (9 Lectures)

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V (9 Lectures)

World Wide Web; Wireless Application Protocol – Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language.

Text Books :

- Jochen Schiller, “Mobile Communications”, Addison-Wesley. (Chapters I, II, III, IV, V), Second edition, 2004.
- Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley,2002.

Reference Books :

- Theodore S. Rappaport, Wireless Communications Principles and Practice, Second Edition, Pearson Education, India. ISBN 978-81-317-3186-4, 2010.

- Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.

Web References :

- http://www3.dsi.uminho.pt/adriano/Teaching/rscm/rscm0506/materiais/C04-Wireless_Telecommunication_Systems.pdf
- http://www.cs.uml.edu/~glchen/cs414-564/handouts/C02Wireless_ Transmission.pdf
- http://www.ibr.cs.tu-bs.de/courses/ss11/mk/material/mk-ss11-slides-ch01.pdf
- http://www.mi.fu-berlin.de/inf/groups/agtech/ teaching/resources/ Mobile_ Communications/course_Material/C04-Wireless_Telecommunication_ Systems.pdf

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CYBER LAWS

(Professional Elective-I)

Internal Marks: 40

Course Code: PP18CSE02 **External marks: 60**

Course Prerequisites: Internet, Hacking, Software Piracy and Intellectual property

Course Objectives:

- Develop the understanding of relationship between commerce and cyberspace
- Enable learner to understand, explore, and acquire a critical understanding Cyber Law.
- Give learners in depth knowledge of Information Technology Act and legal frame work of Right to Privacy, Data Security and Data Protection
- Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cyber crimes that are taking place via the Internet;
- Make learner conversant with the social and intellectual property issues emerging from 'Cyberspace;

Course Outcomes:

- Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.

- Students locate and apply case law and common law to current legal dilemmas in the technology field.
- Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
- Students distinguish enforceable contracts from non-enforceable contracts.
- Students demonstrate leadership and teamwork.

UNIT-I (8 Lectures)

Understanding Computers, Internet and Cyber Laws, Conceptual Framework of Ecommerce, The Role of Electronic Signatures in E-commerce.

UNIT-II (10 Lectures)

Legal Aspects of Electronic Records/Digital Signatures, The Rules and Regulations of Certifying Authorities in India.

UNIT-III (9 Lectures)

International Efforts Related to Cyberspace Laws, Council of Europe (COE) Convention on Cyber Crimes.

UNIT-IV (9 Lectures)

Penalties, Compensation and Adjudication of Violations of Provisions of IT Act and Judicial Review, Some Important Offences under the Cyber space Law and the Internet in India.

UNIT-V (9 Lectures)

The Role of Electronic Evidence and the Miscellaneous Provisions of the IT Act.

Textbooks :

- Harish Chander,"Cyber Laws and IT Protection", 1st Edition, PHI/Pearson, 2014.

Reference Books

- VivekSood, "Cyber Law Simplified", 1st Edition, Fourth Reprint TMH, 2008.

Web References :

- http://www.cyberlawsindia.net/2sides.html.
- http://www.nielit.gov.in/sites/default/files/headquarter/education/pdf/160512_CyberLaw
- https://www.tutorialspoint.com/information_security_cyber_law/cyber_law_objectives

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INTERNET OF THINGS

(Professional Elective-I)

Internal Marks: 40

Course Code: PP18CSE03 **External marks: 60**

Course Prerequisites: Design for Data, Automation, IP Networking

Course Objectives:

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario.

Course Outcomes:

- Design a portable IOT using Arduino/ equivalent boards and relevant protocols.
- Develop web services to access/control IOT devices.
- Deploy an IOT application and connect to the cloud.
- Analyze applications of IOT in real time scenario.

UNIT- I (8 Lectures)

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoTvs M2M.

UNIT- II (10 Lectures)

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT -III (9 Lectures)

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages –Web services.

UNIT- IV (9 Lectures)

Interfaces - Arduino IDE – Programming - APIs and Hacks.

UNIT- V **(**9 Lectures)

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for IoT.

Text Books :

- Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015. (Units- 1,2,3,4,5)
- Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen (Units-4,5)

Reference Books :

- Manoel Carlos Ramon, "Intel Galileo and Intel Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress Open.
- Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing,2014.

Web References :

- https://iflaso-a6174.firebaseapp.com/internet-of-things-a-hands-on-approach-by-arshdeep-bahga-vijay-madisetti.pdf
- https://thebookee.net/net-amp-internet-of-things-ghi-electronics-pdf-dl4261946

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BIG DATA ANALYTICS

(Professional Elective-I)

Internal Marks: 40

Course Code: PP18CSE04 **External marks: 60**

Course Prerequisites: Programming Skills, Understanding of Business and Outcomes and Interpretation of data.

Course Objectives:

- Introduce students the concept and challenge of bigdata (3V's:volume, velocity, and variety).
- Teach students in applying skills and tools to manage and analyze the big data

Course Outcomes:

- Understand the concept and challenge of bigdata and why existing technology is inadequate to analyze the bigdata.
- Collect, manage, store, query, and analyze various form of bigdata.
- Gain hands-on experience on large-scale analytics tools to solve some open bigdata problems.
- Understand the impact of bigdata for business decisions and strategy.
- Understand the Pig Programming Language

UNIT-I (9 Lectures)

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II (9 Lectures)

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III (9 Lectures) Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-IV (8 Lectures)

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom compare Custom Writable: Implementing a Raw Comparator for speed.

UNIT-V (10 Lectures)

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

Text Books :

- Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
- Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly

Reference Books :

- Hadoop in Action by Chuck Lam, MANNING Publ.

- Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

Web References :

- https://www.tutorialspoint.com/hadoop/hadoopquickguide.html
- https://intellipaat.com/tutorial/big-data-and-hadoop-tutorial/
- https://www.guru99.com/bigdata-tutorials.html
- https://www.edureka.co/blog/videos/hadoop-tutorial/

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SOFTWARE PROJECT MANAGEMENT

(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CSE05 **External marks: 60**

Course Prerequisites: Software Designing and Verifications

Course Objectives:

- To study how to plan and manage projects at each stage of the software development lifecycle (SDLC).
- To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
- To understand successful software projects that support organization's strategic goals.

Course Outcomes:

- To match organizational needs to the most effective software development model
- To understand the basic concepts and issues of software project management
- To effectively planning the software projects
- To implement the project plans through managing people, communications and change
- To select and employ mechanisms for tracking the software projects

UNIT -I (9 Lectures)

Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure.

UNIT -II (8 Lectures)

Lifecycle models, Choosing Technology, Prototyping, Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows (Book 2).

UNIT -III (9 Lectures) Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation ,Activity Identification Approaches, Network planning models, Critical path analysis.

UNIT -IV: (8 Lectures)

Risk categories, Identification, Assessment, Planning and management, PERT technique, MonteCarlo approach, **Software Quality:** Planning Quality, Defining Quality - ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality Metrics.

UNIT -V: (10 Lectures)

Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling.

Text Books

- Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill
- Software Project Management, Walker Royce: Pearson Education, 2005.
- Software Project Management in practice, Pankaj Jalote, Pearson.

Reference Books

- Software Project Management, Joel Henry, Pearson Education

Web References

- http://ebooks.bharathuniv.ac.in/gdlc1/gdlc1/Computer%20Science%20Books/Software%20Project%20Management%20.pdf
- http://library.bec.ac.in/kbc/NOTES%20BEC/CSE/8%20SEM/Software%20Project%20Management.pdf

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ADVANCED OPERATING SYSTEMS

(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CSE06 **External marks: 60**

Course Prerequisites: Operating Systems

Course Objectives:

- To examine the fundamental principles of distributed operating systems
- To provide hands-on experiences in developing suitable algorithms for distributed system
- To emphasis on OS resource security and protection and database operating system

Course Outcomes:

- Understand the basic foundation in the design of advanced operating systems.
- Devise algorithms for distributed file systems, distributed shared memory and distributed scheduling.
- Assess the basis of the design of advanced operating systems such as failure recovery and fault tolerance.
- Find the solutions for the problems encountered in the design of advanced operating systems.
- Analyze algorithms for database operating systems

UNIT I (9 Lectures)

Distributed Operating Systems:

Overview, Synchronization Mechanisms, Architectures of Distributed Systems, Theoretical Foundations. Distributed Mutual Exclusion: Preliminaries, A Simple solution to distributed mutual exclusion, Non-Token Based Algorithm, Lamport's Algorithm, RicartAgrawala algorithm. Distributed Deadlock detection, Agreement Protocols: System Model, Classification of Agreement Problem, solution to byzantine agreement problem.

UNIT II (9 Lectures)

Distributed Resource Management:

Distributed File Systems: Architecture, Mechanisms for building distributed file systems; Distributed Shared memory: Algorithms for implementing DSM, Memory Coherence, Coherence protocols; Distributed Scheduling – Issues in Load distribution, Components of load distributing algorithm, Load distributing algorithms.

UNIT- III (9 Lectures)

Fault Tolerance:

Failure Recovery and Fault Tolerance-Recovery: Classification of Failures, Backward and forward error recovery, recovery in concurrent systems, Check pointing; Fault Tolerance: Commit protocols, nonblocking commit protocols, voting protocols, dynamic voting protocols, Failure resilient processes.

UNIT- IV (9 Lectures)

Protection And Security:

Protection and Security-Resource Security and protection: Introduction, Preliminaries, Access Matrix Model, Implementation of Access Matrix, safety in Access matrix model. Multiprocessor Operating systems-Multiprocessor System Architectures – Multiprocessor operating systems.

UNIT- V (9 Lectures)

Database Operating Systems:

Database Operating Systems-Introduction to Database Operating systems, Concurrency Control,Theoretical Aspects, Concurrency Control Algorithms – Basic synchronization primitives, lock based algorithms, Timestamp based algorithms.

Text Book:

- MukeshSinghal, NiranjanG.Shivaratri, Advanced Concepts in Operating Systems: Distributed Database, and Multiprocessor Operating Systems, Tata McGraw-Hill, 2001. ISBN: 0-07-047268-8.

Reference Books:

- Pradeep K. Sinha, Distributed Operating Systems Concepts and Design, Prentice-Hall of India, 2005, ISBN: 81-203-1380-1
- Mary Gorman, Todd Stubbs, and Introduction to Operating Systems: Advanced Course, Course Technology, 2001. ISBN: 0619059443.

Web References

- https://docobook.com/advanced-operating-systems-mukesh-singhal.html
- https://hpdf.info/read/advanced-concepts-in-operating-systems.pdf
- https://www.scribd.com/document/331646669/Pradeep-K-Sinha-Distributed-Operating-Systems-Concepts-and-Design-P-K-Sinha
- https://www.youtube.com/watch?v=MaA0vFKtew&list=PLLDC70psjvq5hIT0kfr1sirNuees0NIbG
- https://drive.google.com/drive/folders/0B-dwArnVnVKYYTdqeWRNTG1qVkU
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M. Tech- I Year I Semester

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INFORMATION RETRIEVAL SYSTEMS

(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CSE07 **External marks: 60**

Course Prerequisites : Retrieval, Design, Analysis and Implementation of IR systems

Course Objectives:

- Become familiar with difference between Information retrieval and Storage Systems
- Students will be able to learn different Inverted files
- Students will be able to understand about PAT Tress.

Course Outcomes:

- Ability to know about Information storage and retrieval systems
- Ability to understand Inverted Files and Signature Files
- To get the knowledge about PAT Trees and Arrays
- Ability to Explain different types of Stemming algorithms
- To get the knowledge about String Searching Algorithms

UNIT- I (9 Lectures)

Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT-II (9 Lectures)

Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques. Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, and Horizontal Partitioning.

UNIT III (9 Lectures)

New Indices for Text, Lexical Analysis and Stop lists: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stop lists.

UNIT- IV (8 Lectures)

Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, Stemming to Compress Inverted Files. Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

UNIT- V (10 Lectures)

String Searching Algorithms: Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The BoyerMoore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Text Books :

- Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA, 2007.
- Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

Reference Books :

- Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
- Information retrieval Algorithms and Heuristics, 2ed, Springer.

Web References :

- https://www.smartzworld.com/notes/information-retrieval-systems-irs/
- https://lecturenotes.in/subject/367/information-retrieval-system-ir
- http://www.btechmaterials.com/download/information-retrieval-system-irs-materials-notes/

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MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CSE08 **External marks: 60**

Course Prerequisites : Computation for Engineers

Course Objectives:

- Presenting the theory of finite automata, as the first step towards learning advanced topics, such as compiler design.
- Applying the concepts learned in fundamental courses such as Discrete Mathematics, in a theoretical setting; in particular, the application of proof techniques.
- Discussing the applications of finite automata towards text processing.
- Developing an understanding of computation through Turing Machines

Course Outcomes:

- Critical, logical-mathematical reasoning
- Ability to apply mathematical knowledge and logic in solving problems.
- Understanding of formal grammar analysis and compilation**.**
- Understanding of Binomial Multinomial theorems
- To get the knowledge about Graphs

UNIT- I (9 Lectures)

Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

UNIT- II (10 Lectures)

Set theory & Relations: Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering, Hasse diagram. Functions: composition of functions, Inverse Function, Recursive Functions, Lattice and its Properties, Pigeon hole Principles and its application. Algebraic structures: Algebraic systems, Examples and general properties, Semi groups and Monoids, groups, sub groups, Definitions, Examples, homomorphism, Isomorphism and related problems.

UNIT- III (8 Lectures)

Elementary Combinatorics: Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, principles of Inclusion – Exclusion.

UNIT- IV (9 Lectures)

Recurrence Relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, The method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

UNIT- V (9 Lectures)

Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Kruskals Algorithm, Binary trees, Planar Graphs, Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

Text Books :

- Discrete Mathematical Structures with Applications to computer science J.P Tremblery,R.Manohar, TMH
- Discrete Mathematical for computer Scientists & Mathematicians " J.L. Molt, A.Kandel ,T.P.Baker, PHI

Reference Books :

- Elements of Discrete Mathematics, C L Liu, D P Mohanpatra, TMH
- Discrete Mathematics, Schaum's Outlines, Lipschutz, Lipson TMH.
- Discrete Mathematical Structures, Kolman, Busby, Ross, 6th ed., PHI, 2009

Web References :

- https://lecturenotes.in/subject/381/mathematical-foundations-of-computer science-mfcs
- https://examupdates.in/mathematical-foundation-of-computer-science/

- https://www.smartzworld.com/notes/mfcs-notes-pdf-mathematical-foundation-of-computer-science/

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ENGLISH FOR RESEARCH PAPER WRITING

Internal Marks: 100

Course Code: PP18CSA01 **External marks: --**

Course Prerequisites: None

Course Objectives:

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

UNIT-I (7 Lectures)

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

UNIT-II (6 Lectures)

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

UNIT-III (5 Lectures)

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

UNIT-IV (5 Lectures)

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

UNIT-V (7 Lectures)

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Text Books :

- Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
- Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

References Books:

- Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
- Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

Internal Marks: 40

Course Code: PP18CSL01 **External marks: 60**

Prerequisite : C Programming

Course Objectives:

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.

Course Outcomes:

- Student will be able to choose appropriate data structure as applied to specified problem definition.
- Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc

List of Experiments

- To implement Stacks& Queues using Arrays & Linked Lists
- To implement Stack ADT, Queue ADT using arrays & Linked Lists
- To implement Dequeue using Double Linked List & Arrays
- To perform various Recursive & Non-recursive operations on Binary Search Tree
- To implement BFS & DFS for a graph
- To implement Merge& Heap sort of given elements
- To perform various operations on AVL trees
- To implement Krushkal's algorithm to generate a min-cost spanning tree
- To implement Prim's algorithm to generate min-cost spanning tree.
- 10.To implement functions of Dictionary using Hashing

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SOFTWARE LAB - I

Internal Marks: 40

Course Code: PP18CSL02 **External marks: 60**

Prerequisites : Java & Andriod

Course Objectives:

- To learn about the concepts and principles of mobile computing;
- To explore both theoretical and practical issues of mobile computing;
- To develop skills of finding solutions and building software for mobile computing applications.

Course Outcomes:

- Grasp the concepts and features of mobile computing technologies and applications;
- Identify the important issues of developing mobile computing systems and applications
- Organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities;
- Develop mobile computing applications by using Wireless tool Kit and tools;

- Organize and manage software built for Mobile Apps deployment.

Mobile Application Development Programs

1)	Write a J2ME program to show how to change the font size and colour.
2)	Write a J2ME program which creates the following kind of menu. *cut,*copy,*paste,*delete,*select all,*unselect all
3)	Create a J2ME menu which has the following options(Event Handling) Cut - can be on/off, Copy - can be on/off, Paste - can be on/off Delete - can be on/off, Select all – put all 4 options on Unselect all – put all
4)	Create a MIDP application, which draws a bar graph to the display. Data values can be given at int [] array. You can enter four data (integer) values to the input text field.
5)	Create an MIDP application which examines, that a phone number, which a user has entered is in the given format (input checking):*Area code should be one of the following: 040, 041, 050, 0400 ,044*
6)	Write a sample program to show how to make a SOCKET connection from J2ME phone. This J2ME sample program shows how to make a SOCKET connection from a J2ME phone. Many a time there is a need to connect backend HTTP server from the J2ME application. show how to make a SOCKET connection from the phone to port 80.
7)	This J2ME sample program shows how to display a simple LOGIN SCREEN on the J2ME phone and how to authenticate to a HTTP server This free J2ME sample program, shows how a J2ME application can do authentication to the backend server.
8)	Web Application using J2ME The following should be carried out with respect to the given set of application domains:(Assume that the Server is connected to the well-maintained database of the given domain. Mobile Client is to be connected to the Server and fetch the required data value/information)
9)	Write an Android application program that displays Hello World using Eclipse.
10)	Write an Android application program that accepts a name from the user and displays the hello name to the user in response as output using Eclipse
11)	Write an Android application program that demonstrates the following: (i) Linear Layout(ii) Relative Layout(iii) Table Layout(iv) Grid View layout
12)	Write an Android application program that converts the temperature in Celsius to Fahrenheit.
13)	Write an Android application program that demonstrates intent in mobile application development

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DATA SCIENCE

Internal Marks: 40

Course Code: PP18CST05 **External marks: 60**

Course Prerequisites: Familiarity with Maths, Statistics and Programming

Course Objectives:

- To make the students get the Knowledge on Data science
- To refresh the knowledge of Data Analysis
- To make the students learn the core concepts of fundamentals of Data Modelling.
- To introduce the concepts of Classification of Data.
- To make the students learn about Fundamentals of Data Science

Course Outcomes:

- Students will apply data science concepts and methods to solve problems in real world Contexts.
- Students will demonstrate proficiency with statistical analysis of data.
- Students will demonstrate skill in Data Modeling.
- Students will have a good understanding of the relationship between a specific Problem and the methods used to solve the problem.
- Students will demonstrate the ability to translate time series data into clear, actionable insights.

UNIT-I (12 Lectures)

Introduction: What is Data Science? What roles exist in Data Science? Current landscape of Perspectives. Define the workflow, tools and approaches data scientists use to analyze data.

Define a problem and identify appropriate data sets using the data science workflow. Walk Through the data science workflow using a case study.

UNIT-II (13 Lectures)

Statistics Fundamentals: Exploratory Data Analysis and the Data Science process analyze Datasets using basic summary statistics: mean, median, mode, max, min, quartile, inter-quartile, range, variance, standard deviation and correlation. Data Visualization-scatter plots, scatter matrix, line graph, box blots, and histograms. Identify a normal distribution with in a dataset using summary statistics and Visualization. Causation Vs Correlation. Test a hypothesis within a sample case study. Validate your findings using statistical analysis.

UNIT-III (12 Lectures)

Foundations of Data Modelling: Introduction Regression-data modeling and linear regression. Categorical variables versus Continuous variables. Build the linear regression/logistic regression Model using a dataset. Fit model-regularization, bias and error metrics. Evaluate model fit Using loss functions-MSE(Mean Square Error), RMSE (Root MSE), Mean Absolute Error(MAE). Apply different regression models based on fit and complexity. Evaluate model Using metrics such as accuracy/error, Confusion matrix, ROC curve and cross Validation.

UNIT-IV (12 Lectures)

Data Science in the real world Dimensionality Reduction-perform dimensionality reduction using topic models such as PCA And SVD. Refine and extract data/information from sample datasets. Introduction to Classification- define classification model, apply k-NN, naïve Classifier and Decision tress. Build the classification model using a dataset and evaluate.

UNIT-V (11 Lectures)

Working with Times series Data-Introduction, observations, sub setting data and selecting Observations, Time series periodicity and Time Intervals, plotting time series.

Text Books :

- The Art of data Science: A Guide for Anyone Who Works withData, Roger D.peng, Elizabeth Matsui, Lean pub, 2015.
- Doing Data science, Straight Talk from The Frontline,Cathy O'Neil and Rachel Schutt. O'Reilly. 2014.

Reference Books :

- Mining of Massive Datasets,JureLeskovek, AnandRajaraman and Jeffrey UIIman, Cambridge University press. 2014.

Web References :

- https://www.datascience.com/learn-data-science
- http://bedfordcomputing.co.uk/learning/wpontent/uploads/2016/09/artofdatascience.
-

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OBJECT ORIENTED SOFTWARE ENGINEERING

Course Code: PP18CST06 **Internal Marks:40**
External marks: 60

Course Prerequisites: Software Engineering

Course Objectives:

- Students will learn the importance of following a process that is driven by the requirements of the users of the system.
- Showing how we apply the process of object-oriented analysis and design to software development.
- Pointing out the importance and function of each UML model throughout the process of object oriented analysis and design and explaining the notation of various elements in these models.
- Providing students with the necessary knowledge and skills in using object-oriented CASE tools

Course Outcomes:

- Relate object oriented concepts representation through artifacts of UML.
- Build and relate classes, their relationships and collaborations (CRC) (for any case study).
- Generate the list and order of activities carried out for each behavior exhibited by any system
- Design advanced behavioral concepts to deploy the model
- Apply the project development activities of software engineering

UNIT-I

Introduction to Object Oriented Software Engineering (12 Lectures)

Nature Of The Software, Types Of Software , Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction To Object Orientation, Concepts Of Data Abstraction, Inheritance & Polymorphism, Software Process Models-Waterfall Model, The Opportunistic Model , The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model

UNIT-II (12 Lectures)

Requirements Engineering: Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.

UNIT-III (13 Lectures)

Unified Modeling Language & Use Case Modeling: Introduction To UML, Modeling Concepts, Types Of UML Diagrams With Examples; User-Centred Design, Characteristics Of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics Of User Interface Design, Usability Principles, User Interfaces.

UNIT-IV (11 Lectures)

Class Design and Class Diagrams: Essentials Of UML Class Diagrams, Associations And Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features Of Class Diagrams, Interaction And Behavioral Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And Deployment Diagrams.

UNIT-V (12 Lectures)

Software Design And Architecture: The Process Of Design, Principles Leading To Good Design, Techniques For Making Good Design Decisions, Writing A Good Design Document., Pattern Introduction, Design Patterns: The Abstraction-Occurrence Pattern, General Hierarchical Pattern, The Play-Role Pattern, The Singleton Pattern, The Observer Pattern, The Delegation Pattern, The Adaptor Pattern.

Text Books :

- Object-Oriented Software Engineering Practical software development using UML and Java by Timothy C. Lethbridge & Robert, Langaniere Mcgraw-Hill

Reference Books :

- Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.
- Software Engineering: A Practitioner's Approach, Roger S Pressman.

Web References :

- 1.http://www.montefiore.ulg.ac.be/~boigelot/cours/se/slides/se.pdf
- 2.http://www.puwabeyyyinofykof.xpg.com.br/ivar-jacobson-pdf.pdf
- https://openlibrary.org/books/OL1718405M/Object-oriented_software_engineering

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ADVANCED COMPUTER ARCHITECTURE

Internal Marks: 40

Course Code: PP18CST07 **External Marks: 60**

Course Prerequisites: Fundamentals of Processor hardware and low level software

Course Objectives:

- To understand basic components of computers.
- To understand the architecture of 8086 processor.
- To understand the representation of data at the machine level and how computations are performed at machine level.
- To understand the memory organization and I/O organization.
- To understand the parallelism both in terms of single and multiple processors.

Course Outcomes:

- Able to understand the basic components and the design of CPU, ALU and Control Unit.
- Ability to understand memory hierarchy and its impact on computer cost/performance.
- Ability to understand the advantage of instruction level parallelism for high performance Processor design.
- Ability to understand the Compiler level techniques
- Ability to understand the Multi Processors.

UNIT – I (13 Lectures)

Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, Classifying instruction set- Memory addressing- type and size of operands, Operations in the instruction set.

UNIT – II (13 Lectures)

Pipelines: Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties. Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT – III (11 Lectures)

Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

UNIT – IV (11 Lectures)

ILP Software Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT – V (12 Lectures)

Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared memory architecture, Synchronization.

Text Books :

- John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

Reference Books :

- John P. Shen and Miikko H. Lipasti - Modern Processor Design : Fundamentals of Super Scalar Processors
- Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.

Web References :

- https://lecturenotes.in/subject/110/advanced-computer-architecture-aca
- https://doc.lagout.org/science/0_Computer%20Science/Computer%20Architecture/Advanced%20Computer%20Architecture%20and%20Parallel%20Processing

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WEB TECHNOLOGIES

Course Code: PP18CST08 **Internal Marks: 40**

External marks: 60

Course Prerequisites: Application Programming

Course Objectives:

- Web site planning, management and maintenance.
- Developing the web pages with the help of frames, scripting languages, and evolving technology like DHTML, XML.
- Developing applications using Java GUI components
- The concept of designing secure web pages using java based technologies like Servlets and JSP.

Course Outcomes:

- Design web pages using standard web deigning tools like HTML, DHTML and server based technologies like Servlets and JSP.
- Design Java applications using GUI components such as Applets and Swings.
- Understand how java GUI components may access enterprise data bases.
- Understand the use of APIs in robust, enterprise three level application developments.
- Understand the Java features for secure communications over the internet

UNIT I (12 Lectures)

HTML Common tags - List, Tables, images, forms, Frames, Cascading Style sheets, Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script. XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

UNIT II (12 Lectures)

Review of Applets: Event Handling, AWT Programming. Introduction to Swing: Handling Swing Controls like Icons – Labels – Buttons – Text Boxes – Combo – Boxes – Tabbed Panes – Scroll Panes – Trees – Tables Differences between AWT Controls & Swing Controls, JApplet, Developing a Home page using Applet & Swing.

UNIT III (13 Lectures)

Web servers: Tomcat Server installation & Testing. Servlets & Application Development: Lifecycle of a servlet, JSDK, The servlet API, The javax.servlet Package, Reading servlet

parameters, Reading initialization parameters, Handling Http Request &Responses, Using Cookies-Session Tracking, Security Issues. Database Access: Database Access, Database Programming using JDBC Studying Java.sql package, accessing a database from a servlet application.

UNIT IV (11 Lectures)

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC architecture. AJAX.

UNIT IV (12 Lectures)

JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing, Declaring Variables and Methods, Sharing Data between JSP pages, Sharing Session and Application Data – Memory Usage Considerations, Accessing a Database from a JSP Page Application.

Text Books :

- Dietel&Dietel, Internet& World Wide Web.PHI.
- Patrick Naughton and Herbert Schildt, The complete Reference Java 2. 5 ed, TMH (Chapters: 25) (UNIT 2,3)
- Hans Bergsten and SPD O'Reilly, Java Server Pages. (UNITs 3,4,5)

Reference Books :

- Marty Hall and Larry Brown, Programming world wide web- Servlets and Java Server Pages Volume 1: Core Technologies. Pearson

Web References :

- https://www.w3schools.com/html/default.asp
- http://edutechwiki.unige.ch/en/Web_technology_and_web_design_tutorials
- https://www.scss.tcd.ie/owen.conlan/CS7062/1_Web_Technologies_Handout.pdf

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CYBER SECURITY

(Professional Elective-III)

Course Code: PP18CSE09 **Internal Marks: 40**
External marks: 60

Course Prerequisites: Networks and Systems

Course Objectives:

- Comprehend the history of computer security and how it evolved into information security.
- Understand the threats posed to information security and the more common attacks associated with those threats.
- Understand the concept of developing encryption and decryption algorithms
- Understand the various techniques of encryption, key management in security and its importance.
- Understand the threats present in computer networks and counter measures for the same.

Course Outcomes:

- Able to understand the basic concepts and goals of Information security.
- Able to examine different classical cryptosystems.
- Able to understand the ideas of public key cryptosystems and digital signature schemes.
- Able to examine different network security protocols.
- Able to understand access control and authentication mechanisms.

UNIT- I: (9 Lectures)

Introduction: Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT- II (9 Lectures)

Conventional Encryption: Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC

UNIT- III (10 Lectures)

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms Public key: Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

UNIT- IV (9 Lectures)

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction(SET) Email Privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT- V (8 Lectures)

Intrusion Detection: Intruders, Intrusion Detection systems, Password Management. Malicious Software: Viruses and related threats & Countermeasures. Fire walls: Firewall Design principles, Trusted Systems.

Text Books :

- Network Security & Cryptography: Principles and Practices, William Stallings, PEA, Sixth edition
- Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, WileyDreamtech.

Reference Books :

- Network Security & Cryptography, Bernard Menezes, Cengage, 2010.

Web References :

- https://lecturenotes.in/subject/611/cyber-security-cs
- https://www.njconsumeraffairs.gov/News/Brochures/Cyber-Security-Handbook.pdf

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ADVANCED DATABASES

(Professional Elective-III)

Course code: PP18CSE10 **Internal Marks: 40**

External marks: 60

Course Prerequisites: Relational Database and Database Fundamentals

Course Objectives:

- To understand conceptual modeling techniques, database design and Implementation.
- To get insights of DBMS system architecture and its design issues
- To have knowledge on state of the art applications of distributed database systems.

Course Outcomes:

- Construct the conceptual model and relational model for the given database application.
- Investigate the concepts in distributed database system design and maintenance of data integrity.
- Optimize the query processing by exploiting a large amount of useful information about the data.
- Exhibit the advantages and disadvantages of the various parallel database system architectures.
- Apply the knowledge on state of the art applications which are based on database.

UNIT I: (9 Lectures)

Introduction: Database system concepts and architecture, Data modeling using E-R model, Relational model, Relational algebra, ER to Relational model mapping, Schema Refinement, Functional Dependencies, Normal forms based on primary keys, Second and Third normal forms, BoyceCodd normal form, properties of decompositions. Normalization, Schema refinement in database design, multivalued dependencies, fourth normal form, Join Dependencies, fifth normal form.

UNIT II: (9 Lectures)

Distributed DBMS: Introduction, Distributed DBMS architecture, DBMS standardization, Architecture models fordistributed DBMSs, Distributed DBMS Architecture, Distributed database design, design strategies, design issues, fragmentation, allocation, semantic data control, view management, data security, semantic integrity control.

UNIT III: (9 Lectures)

Query Processing and Optimization

Query processing problem, objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data, query optimization, centralized query optimization, join ordering in fragment queries, distributed query optimization algorithms.

UNIT IV: (10 Lectures)

Parallel Database and Distributed Object Database Systems: Database servers, Parallel architectures, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture, Fundamental objet concepts and object models, Object distributed design, Architectural issues, Object management, Distributed object storage,Object query processing, Transaction management.

UNIT V: (8 Lectures)

Current Issues: Data warehousing–data mining, mobile database, multimedia database, geographic information systems, genome data management, Peer-to-Peer Data Management, Web Data Management Streaming Data and Cloud Computing

Text Books:

- RamezElmasri&Shamkant B. Navethe, Fundamentals of Database Systems, fourth Edition, Pearson Education, 2004. (Unit I)
- Tamer Ozsu. M., Patrick Valduriez, Principles of Distributed Database Systems, Third Edition, Springer, 2011. (Unit II, III, IV, & V)

Reference Books:

- Abraham Silberchatz, Henry F. Korth, S.Sudarsan, Database System Concepts, Fifth Edition, McGraw-Hill, 2006. (Unit I)
- Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles and Systems, McGraw-Hill International Editions, 1985.
- Rajesh Narang, Object Oriented Interfaces and Databases, Prentice Hall of India, 2002.

Web References:

- https://dsinghpune.wordpress.com/advanced-database-management-system/
- http://www.faadooengineers.com/threads/3172-ADBMS-Ebook-(Advanced-Database-Management-System)
- https://coe-portal.cse.ohio-state.edu/pdf-exports/CSE/CSE-5242.pdf

M. Tech- I Year II Semester **L T P C**
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SOCIAL NETWORK ANALYSIS
(Professional Elective-III)

Internal Marks: 40
Course code: PP18CSE11 **External marks: 60**

Course Prerequisites: Fundamental Concepts of Social Networks

Course Objectives:
- To understand Social Networks
- To understand the role of ontology and inference engines in semantic web

Course Outcomes:
- Demonstrate knowledge and be able to explain the three different "named" generations of the web.
- Demonstrate the ability to applications and the analysis of Web data.
- Be able to understand and analyze key Web applications including search engines and social networking sites.
- Be able to understand and explain the key aspects of Web architecture and why these are important to the continued functioning of the World Wide Web.
- Be able to analyze and explain how technical changes affect the social aspects of Web-based computing.
- Be able to develop "linked data" applications using Semantic Web technologies.

UNIT-I (8 Lectures)
The Semantic web: Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

UNIT-II (9 Lectures)
Social Network Analysis: What is network analysis?, Development of Social Network Analysis, Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT-III (8 Lectures)
Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web, Ontology languages for the semantic Web.

UNIT-IV (11 Lectures)

Modeling and Aggregating Social Network Data: State of the art in network data representation, Ontological representation of Social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.

UNIT-V (9 Lectures)

Developing social semantic applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

Text Books :

- Social Networks and the OntologyBased Systems, J.Davies,Rudi Studer,Paul Technologies ,Trends and Research in Semantic Web Warren,JohnWiley&Sons.

Reference Books :

- Services –Liyang Lu Chapman and Hall/CRC Publishers,(Taylor Semantic Web and Semantic Web & Francis Group)
- Springer – Heiner Stuckenschmidt; Frank Van Harmelen, semantic Web Information Sharing on the Publications

Web References

- https://www.kaggle.com/crailtap/basic-network-analysis-tutorial
- http://www.thanachart.info/wp-content/uploads/SocialNetworkAnalysis-Tutorial.pdf
- https://www.lynda.com/course-tutorials/Social-Network-Analysis-Using-R/508872-2

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SOFT COMPUTING
(Professional Elective-III)

Internal Marks: 40

Course Code: PP18CSE12 **External marks: 60**

Course Prerequisites: Neural networks and Fuzzy logic

Course Objectives:

- Introduce students to soft computing concepts and techniques
- Foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.
- Explain the students about fuzzy sets and its operations,
- Introduce students to fuzzy systems, fuzzy logic and its applications
- Explain the students about Artificial Neural Networks and various categories of ANN.

Course Outcomes:

- Able to understand genetic algorithm fundamentals and its operators and procedure
- Understand artificial neural network model and its activation functions
- Understand different operations of Neural Networks

UNIT-I (8 Lectures)

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

UNIT-II (9 Lectures)

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications

UNIT-III **(9** Lectures)

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzifications, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

UNIT-IV (10 Lectures)

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques, perception and convergence rule, Autoassociative and hetro-associative memory, Hebb's Learning, Adaline, Perceptron

UNIT-V (9 Lectures)

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Text Books :

- Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rajsekaran and G.A. Vijayalakshmi Pai, Prentice Hall of India.
- Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
- Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997.

Reference Books :

- Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
- Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR. AddisonWesley
- Learning and Soft Computing, V. Kecman, MIT Press, 2001
- Fuzzy Sets and Fuzzy Logic, Klir & Yuan, PHI, 1997

Web References :

- https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_neural_networks.htm
- http://lassonde.yorku.ca/course-directory/eecs-4403-300
- https://lecturenotes.in/subject/124/soft-computing-sc

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CLOUD COMPUTING

(Professional Elective-IV)

Course Code: PP18CSE13 **Internal Marks: 40**

External marks: 60

Course Prerequisites: Basic understanding of servers/computers

Course Objectives:

- To impart fundamental concepts of cloud computing.
- To differentiate Parallel and distributed computing.
- To impart knowledge in design of cloud computing.
- To impart knowledge in applications of cloud computing.
- To impart knowledge in different aspects of security in cloud computing.

Course Outcomes:

- Understanding the protocols and mechanisms that support cloud computing
- Understanding the hardware necessary for cloud computing
- Understanding Cloud Resource Virtualization
- Understanding Cloud Resource Management and Scheduling
- Understand cloud security

UNIT- I (8 Lectures)

Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing

Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

UNIT -II (9 Lectures)

Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing.

Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

UNIT- III (10 Lectures)

Cloud Resource Virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades

Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling

UNIT- IV (9 Lectures)

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., ApacheHadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2) Cloud Security: Cloud security risks, security – atop concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

UNIT- V (9 Lectures)

Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming.

Text Books :

- Cloud Computing, Theory and Practice, Dan C Marinescu, MKElsevier
- Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, RobertElsenpeter, TMH

Reference Books :

- Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

Web References :

- https://www.simplilearn.com/cloud-computing-architecture-article
- https://cloudacademy.com/blog/cloud-computing-architecture-an-overview/
- https://www.cloudcruiser.com/cloud-computing-architecture/

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BIO INFORMATICS
(Professional Elective-IV)

Internal Marks: 40

Course Code: PP18CSE14 **External marks: 60**

Course Prerequisites: Knowledge of informatics, *biology and genetics*

Course Objectives:

- Computational approach to solve biological problems
- Different data visualization techniques
- Basic biological databases and algorithms for proteomics and genomics analysis.
- Bioinformatics packages to solve the biological problems.

Course Outcomes:

- Know the differences between genomics and proteomics.
- Understand different data visualization techniques
- Understand and analyze how to solve the biological problems using computational approach
- Understand and analyze internet packages of bioinformatics.

UNIT- I (9 Lectures)

Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy. Protein Information Resources: Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

UNIT- II (9 Lectures)

Genome Information Resources: DNA sequence databases, specialized genomic resources DNA Sequence analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

UNIT- III (8 Lectures)

Pair wise alignment techniques: Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dot plot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

UNIT- IV (9 Lectures)

Multiple sequence alignment: Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching.

UNIT- V (10 Lectures)

Secondary database searching: Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

Analysis packages: Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text Books:

- T K Attwood & D J Parry-Smith, Introduction to Bioinformatics, Addison Wesley Longman, New Delhi.

Reference Books:

- Michel Claveriw, CerdricNotredame, "Bioinformatics- A Beginner's Guide", WILEY DreamTech India Pvt. Ltd,2000.
- Scott Markel &Darryl Leon "Sequence Analysis in A Nutshell", O'REILLY,2003.

Web References:

- https://courses.cs.ut.ee/MTAT.03.242/2017_fall/.../Basics_of_Bioinformatics.pdf
- http://bioinformaticsinstitute.ru/sites/default/files/an_introduction_to_bioinformatics_algorithms_-_jones_pevzner.pdf

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ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING
(Professional Elective-IV)

Internal Marks: 40

Course Code: PP18CSE15 **External marks: 60**

Course Prerequisites: Calculus, Linear Algebra, Basic Statistics and Probability

Course Objectives:

- Definition and origins of AI.
- Basic knowledge of neural networks and expert systems
- Wide variety of neural network models and their applications.
- Creating and using neural network models.
- Some mathematical understanding of neural network models.

Course Outcomes:

- Understand the principles of problem solving and be able to apply them successfully.
- Be familiar with techniques for computer-based representation and manipulation of complex information, knowledge, and uncertainty.
- Gain awareness of several advanced AI applications and topics such as intelligent agents, planning and scheduling, machine learning.
- Understand various types of neural networks used for purposes such as in discriminators, classifiers, computation.
- Understand how neural networks are implemented using training algorithms such as feed forward, back-propagation.

UNIT- I (9 Lectures)

Problems, Problem Spaces And Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs. Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis

UNIT-II (9 Lectures)

Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction. Weak Slot-and-Fillers Structures: Semantic Nets, Frames Strong Slot-and- Fillers Structures: Conceptual Dependency, Scripts

UNIT- III (10 Lectures)

Overview – applications - Engg approaches in NN - Biological Inspiration - Learning Approaches - Mathematical Fundamentals for ANN Study. Elementary building blocks biological neural units - artificial unit structures - unit net activation to output characteristics - artificial unit model extensions - single unit mappings and the perceptron - linear seperability – perceptrons - adaline – madaline - MLP NN based pattern associators - PA design and evaluation - linear associative mappings.

UNIT- IV (8 Lectures)

Recurrent Networks - Hopfield Network design - applications to optimization problem Application to Traveling salesman problem – BAM.

UNIT- V (9 Lectures)

Self Organizing Networks – Introduction – clustering – kohonen – ART networks – Learning Theroies – Dynamics – Applications. RBF – Design – Training – Applications – TDNN – Learning – Applications.

Text Books :

- Elaine Rich and Kevin Knight, Artificial Intelligence. 2 ed, TMH.
- Robert J Schalkoff, Artificial Neural Networks. TMH, 1997.

Reference Books :

- Patrick Henry Winston, Artificial Intelligence., Pearson Education/Prentice Hall of India.
- Russel and Norvig, Artificial Intelligence. Prentice Hall of India/Pearson Education.

Web References :

- http://neuralnetworksanddeeplearning.com/index.html
- http://users.metu.edu.tr/halici/courses/543LectureNotes/543index.html

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PARALLEL PROCESSING
(Professional Elective-IV)

Internal Marks: 40

Course code: PP18CSE16 **External marks: 60**

Course Prerequisites: Programming language C, Computer Systems

Course Objectives:

- To understand the scope, design and model of parallelism.
- Know the parallel computing architecture.
- Know the Characteristics, model and design of parallel algorithms.
- Analytical modeling and performance of parallel programs.
- Solve a complex problem with message passing model and programming with MPI.

Course Outcomes:

- Recall fundamental concepts of parallelism
- Design and analyze the parallel algorithms for real world problems and implement them on available parallel computer systems.
- Reconstruction of emerging parallel algorithms with MPI.
- Compute contemporary parallel algorithms.

UNIT-I (9 Lectures)

Introduction to Parallel Computing: Parallel Programming and Parallel Computing, Overview of Parallel Architectures and Parallel Programming Models, MIMD and SPMD Models, Problems Unique to Parallel Programming

UNIT-II (9 Lectures)

Supercomputers and Grand Challenge Problems, Modern Parallel Computers, Data Dependence Graph, Data Parallelism, Functional Parallelism, Pipelining and Data Clustering.

UNIT-III (8 Lectures)

Interconnection Networks: Switch Network Topologies, Direct and Indirect Network Topology, Bus, Star, Ring, Mesh, Tree, Binary Tree Network, Hyper Tree Network, Hybrid, Hypercube, Perfect Shu E Network, Torus and Butterfly Network.

UNIT-IV (10 Lectures)

Performance Analysis: Introduction, Execution Time, Speedup, Linear and Super linear Speedup, Efficacy and Efficiency, Amdahls Law and Amdahl Effect, Gustafson-Barsiss Law, Minsky's Conjecture, The Karp-Flatt Metric, The Iso-Efficiency Metric, Iso-Efficiency Relation, Cost and Scalability.

Parallel Computational Models: Flynns Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW and EREW, PRAM Algorithms.

UNIT-V (9 Lectures)

Introduction to Parallel Algorithms: Parallel Programming Models, PVM, MPI Paradigms **Parallel Programming Languages:** , Brents Theorem, Simple Parallel Programs in MPI Environments, Parallel Algorithms on Network, Addition of Matrices, Multiplication of Matrices.

Text Books :

- Computer Architecture and Parallel Processing, Hwang and Briggs, McGraw Hill.
- Parallel Programming in C with MPI and Open MP, Michael J.Quinn, McGrawHill 2004

Reference Books :

- Introduction to Distributed and Parallel Computing, Crichlow, PHI.

- Designing Efficient Algorithms for Parallel Computers, M.J.Quinn, McGraw-Hill.

Web References

- https://www.tutorialspoint.com/parallel_algorithm/parallel_algorithm_introduction.htm
- https://www.studytonight.com/computer-architecture/parallel-processing-and-data-transfer
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PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Internal Marks: 100

Course Code: PP18CSA02

Course Prerequisites: None

Course Objectives:

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

Course Outcomes:

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and 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 (6 Lectures)

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 (5 Lectures)

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III (6 Lectures)

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

UNIT-IV (7 Lectures)
Statements of basic knowledge.
Shrimad BhagwadGeeta:
Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT-V (6 Lectures)
Personality of Role model.
Shrimad BhagwadGeeta:
Chapter2-Verses 17,
Chapter 3-Verses 36,37,42,
Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

References:

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

M. Tech- I Year II Semester **L T P C**

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SOFTWARE LAB – II

Course Code: PP18CSL03 **Internal Marks: 40**
External marks: 60

Prerequisites: None

Course Objectives:

- Inspiring the students towards Web
- Encouragement of the students to deeply study about Web Technologies
- Learning to Create Dynamic Web Pages
- Learning about Prolog Programming Language

Course Outcomes:

- Design static and dynamic web pages with help of HTML, Javascript and CSS.
- Apply Java Applets in real world applications.
- Create JSP programs that solve simple business problems.
- Create Prolog programs that solve simple problems

List of Experiments: (Web Technologies)

- Design a webpage that reflects the details of a College using simple HTML tags.
- Design a web application using different types of CSS.
- Design a student database using XML and display the content using XSL by
- Validating through XML schema.
- Design a user registration form using Java Applets.
- Develop a menu based application page using java swings.
- Develop a home page for college using Swings.
- Design a simple java servlet application to retrieve the data from a client form
- and display the data.
- Design a java application to perform all the DML operations on a database.
- Design a web application for user management using Java servlets.
- Design a simple JSP application to perform simple operations.
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List of Programs (Artificial Intelligence):

- Write a Prolog Program to add two numbers.
- Write a Prolog Program to categorize animal characteristics.
- Write a Prolog Program to read address of a person using compound variable.
- Write a Prolog Program of fun to show concept of cut operator
- Write a Prolog Program to count number of elements in a list
- Write a Prolog Program to reverse the list.

- Write a Prolog Program to append an integer into the list
- Write a Prolog Program to replace an integer from the list
- Write a Prolog Program to delete an integer from the list
- Write a Prolog Program to show concept of list.
- Write a Prolog Program to demonstrate family relationship.
- Write a Prolog Program to show how integer variable is used in prolog program.

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M.Tech. II Year I Semester

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RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS

Internal Marks: 100 Course

Code: PP18MCT01

Prerequisites: None

Course Objectives:

- Understand some basic concepts of research and its methodologies.
- Identify appropriate research topics.
- Select and define appropriate research problem and parameters.
- Prepare a project proposal (to undertake a project)
- Organize and conduct research (advanced project) in a more appropriate manner.
- The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.

Course Outcomes:

- Understand research problem formulation.
- 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.

UNIT- I (7 Lectures)

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

UNIT-II (6 Lectures)

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 (6 Lectures)

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 (5 Lectures)

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

UNIT-V (6 Lectures)

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.

Text Books :

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

References Books :

- Ranjit Kumar, 2 ndEdition, "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.
- Mayall, "Industrial Design", McGraw Hill, 1992.

Web References ;

- https://www.isical.ac.in/~palash/research-methodology/RM-lec4.pdf\
- http://www.bitspilani.ac.in/uploads/Patent_ManualOct_25th_07.pdf
- https://my.cumbria.ac.uk/media/MyCumbria/IPR-notes-and-guidance.pdf

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