FACULTY OF ENGINEERING

Kengeri Campus, Kanminike, Kumbalgodu, Bangalore – 560074

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MASTER OF TECHNOLOGY

INFORMATION TECHNOLOGY (DATA ANALYTICS)

BATCH 2020-2022

1.INTRODUCTION

CHRIST(Deemed to be University) blossomed out of the educational vision of the Carmelites of Mary Immaculate (CMI) congregation founded by St Kuriakose Elias Chavara. He was a visionary, an educationist and a social reformer of the nineteenth century who founded the Congregation in 1831 in South India.

CHRIST(Deemed to be University) was established in July 1969 as Christ College. It was the first institution in Karnataka to be accredited by the National Assessment and Accreditation Council (NAAC). University Grants Commission (UGC) conferred Autonomy to the institution in 2004. It became the first College in South India to be reaccredited with A+ by NAAC in 2005. UGC identified it as an Institution with Potential for Excellence in 2006.Under Section 3 of the UGC Act, 1956, Ministry of Human Resources Development of the Union Government of India, vide Notification No. F. 9-34/2007-U.3 (A), declared Christ College as a Deemed to be University, in the name and style of CHRIST(Deemed to be University)in July 2008. The CHRIST was accredited with 'A' Grade by NAAC in 2016.

CHRIST(Deemed to be University)offers 46 Bachelor, 47 Master, 16 MPhil and 17 PhD Programs in Humanities, Social Sciences, Sciences, Commerce and Management, Education, Law and Engineering. The Institution which celebrates diversity has students from all the states of India and 58 countries across the globe.

CHRIST(Deemed to be University)rooted in Gospel values, is committed to provide holistic education through the development of intellectual competence, personal skills, inter-personal skills and societal skills. CHRIST welcomes to its fold students from all over the country and the world in an environment of religious harmony and secularism.

VISION
"EXCELLENCE AND SERVICE"

❖ CHRIST(Deemed to be University), a premier educational institution, is an academic fraternity of individuals dedicated to the motto of excellence and service. We strive to reach out to the star of perfection through an earnest academic pursuit for excellence and our efforts blossom into 'service' through our creative and empathetic involvement in the society to transform it.

❖ Education prepares one to face the challenges of life by bringing out the best in him/her. If this is well accepted, education should be relevant to the needs of the time and address the problems of the day. Being inspired by Blessed Kuriakose Elias Chavara, the founder of Carmelites of Mary Immaculate and the pioneer in innovative education, CHRIST(Deemed to be University) was proactive to define and redefine its mission and strategies reading the signs of the time.

MISSION STATEMENT
"CHRIST(Deemed to be University) is a nurturing ground for an individual's holistic development to make effective contribution to the society in a dynamic environment."

CORE VALUES
The values which guide us at CHRIST(Deemed to be University) are:

Faith in God
Moral Uprightness
Love of Fellow Beings
Social Responsibility
Pursuit of Excellence

Department Vision

"To fortify Ethical Computational Excellence"

Department Mission

1. Imparts core and contemporary knowledge in the areas of Computation and Information Technology

2. Promotes the culture of research and facilitates higher studies
3. Acquaints the students with the latest industrial practices, team building and entrepreneurship
4. Sensitizes the students to serve for environmental, social & ethical needs of society through lifelong learning.

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GRADUATE ATTRIBUTE

- Ability to comprehend the problem in a specific domain and implementation of the solution in an ethical way.
- Ability to use skilled communication to enhance understanding and work in a team to contribute positively with an international perspective
- Ability to exhibit skills in research and enquiry based learning to identify and creatively tackle problems.
- Ability to execute a team project in the specific domain after going through the process of understanding, analyzing, designing, implementing and testing with real time data.
- Ability to execute a solution based for social cause.

2. .PROGRAMMES OFFERED

- **Undergraduate Programmes**(B.Tech, 8 Semester Program)
    - Bachelor of Technology in Automobile Engineering (AE)
    - Bachelor of Technology in Civil Engineering(CIVIL)
    - **Bachelor of Technology in Computer Science and Engineering (CSE)**
    - Bachelor of Technology in Electronics and Communication Engineering (ECE)
    - Bachelor of Technology in Electrical and Electronics Engineering (EEE)
    - **Bachelor of Technology in Information Technology (IT)**
    - Bachelor of Technology in Mechanical Engineering (ME)

- **Postgraduate Programmes**(M. Tech, 4 Semester Program)
    - **Master of Technology in Computer Science and Engineering (CSE)**
    - Master of Technology in Communication Systems(ECE)
    - **Master of Technology in Information Technology(Data Analytics)**
    - Master of Technology in Machine Design(MD)
    - Master of Technology in Power Systems(PS)
    - Master of Technology in Structural Engineering(SE)

- **Doctoral Programmes (Ph.D.)**(Doctor of Philosophy)
    - **Doctor of Philosophy (Ph.D.) in Computer Science and Engineering**
    - Doctor of Philosophy (Ph.D.) in Electronics and Communication Engineering

- Doctor of Philosophy (Ph.D.) in Civil Engineering
- Doctor of Philosophy (Ph.D.) in Electrical and Electronics Engineering
- Doctor of Philosophy (Ph.D.) in Mechanical Engineering
  - **Doctor of Philosophy (Ph.D.) in Information Technology**

03. ELIGIBILITY CRITERIA

For Undergraduate Programmes

A pass in PUC (10+2) or equivalent with 50% marks in aggregate with Mathematics, Physics and Chemistry is the minimum eligibility for admission.

Lateral Entry:

Candidates who have successfully completed 3 year diploma in Engineering are eligible to apply for lateral entry into:
- Automobile Engineering (AE)
- B.Tech Civil Engineering (CE)
- B.Tech Mechanical Engineering (ME)
- **B.Tech Computer Science and Engineering (CSE)**
- B.Tech Electronics & Communication Engineering (ECE)
- B.Tech Electrical and Electronics Engineering (EEE)
- **B.Tech Information Technology (IT)**

Candidates will be admitted to second year of the programme only after appearing the CHRIST(Deemed to be University)selection process for Engineering programmes.

❖ **For Postgraduate Programmes**:
  o **For Master of Technology in Computer Science and Engineering**
    o **A Pass in B.Tech/B.E or M.Sc with 55% aggregate.**
  o For Master of Technology in Communication Systems
    o A Pass in B.Tech/B.E or M.Sc in Electronics and VLSI Design with 55% aggregate.
  o For Master of Technology in Civil Engineering
    o A Pass in BE/B.Tech or M.Sc in Civil and VLSI Design with 55% aggregate.
  o For Master of Technology in Mechanical Engineering
    o A Pass in BE/B.Tech with 55% aggregate.
  o **For Master of Technology in Information Technology (Data Analytics)**
    o **A Pass in B.Tech/B.E or M.Sc with 55% aggregate.**

❖ **For Doctoral Programmes (Ph.D.):**
  ● A pass with 55% marks in post graduation and equivalent in the relevant subject from any recognized university.
  ● A research proposal (Maximum 1500 words) has to be submitted along with the application.

4. SELECTION PROCESS

1) Candidates can process the admission based on the Undergraduate Entrance Test and Ranking by COMEDK.

<center>OR</center>

2) CHRIST(Deemed to be University) Selection Process as given below:

Process	Particulars	Date	Venue/Centre
Entrance Test	CHRIST(Deemed to be University)Entrance test for each candidate	As per the E- Admit Card	As per the E- Admit Card
Personal Interview	Personal interview for 15 minutes for each candidate by an expert panel	As per the E-Admit Card	As per the E- Admit Card
Academic Performance	Assessment of past performance in Class 10, Class 11/12 during the Personal Interview	As per the E-Admit Card	As per the E- Admit Card

5. ADMISSION PROCESS

Candidates will be intimated about the Selection status (Selected/Wait Listed/Not Selected) through the University Notice Board/on the "Application Status" link on University website. The Selection results will be declared within 24 hours of Personal Interview session.

The selected candidates must process admission at **Office of Admissions, Central Block,** CHRIST(Deemed to be University) **within 3 working days of declaration of Selection Process results/as per the stipulated date and time mentioned by Office of Admissions.**

Selected candidates should collect the Fee Challan from the Office of Admissions and remit the Annual fee at the South Indian Bank, CHRIST(Deemed to be University) Branch. The Offer of Admission will stand cancelled, if failing to remit the fee within the stipulated date and time.

Admission will not be processed without the presence of the candidate and the mandatory original documents mentioned below;

1. The Offer of Admission Card (E-Admission Card/Mail)
2. Class 10 Marks Statement
3. Class 11 Marks Statement, if Candidate is pursuing class 12 and appearing for final examination during March-April Month
4. Class 12 Marks Statement, if candidate has appeared and passed the Class 12 examination

The Institution ID card is a smart card, which is both an ID card as well as a South Indian Bank ATM card with a chip containing the student personal details. All transactions within the University campus after commencement of classes, including fees payment will be processed only through this card. It is also an access card for Library and other restricted places. Candidates are advised to collect the South Indian Bank account opening form along with fees challan and process it at the Bank branch within the Institution premises.

Candidates who fall under International student category (ISC), If selected, should register with the Foreigner Regional Registration Officer (FRRO/FRO) of the Local Police in Bangalore, India within 14 working days from the date of admission or arriving in Bangalore.

All International student category (ISC) candidates if studied in India should obtain an NOC from the previous qualifying institution.

6. GENERAL RULES

- There is a grading scheme for each paper and for all the courses.
- All marks will indicate the marks, percentage obtained, grade and grade point average.
- The grade point average will be calculated as follows: for each subject, multiply the grade point with the number of credits; divide the sum of product by the total number of credits.
- The CGPA [Cumulative GPA] is calculated by adding the total number of earned points [GP x Cr] for all semesters and dividing by the total number of credit hours for all semesters.

$$\text{GPA=} \frac{\sum[\text{GPA x Cr}]}{\sum \text{Cr}} \frac{\sum[\text{GPA x Cr}]}{\sum \text{Cr}}$$

7. GRADING SCHEME FOR EACH PAPER: POSTGRADUATE COURSES

Percentage	Grade	Grade Point- 4 Point Scale	Grade Point-10 Point Scale	Interpretation	Class
80 and above	A+	4.0	10.00	Excellent	First Class with Distinction
75-79	A	3.75	9.38	Very Good	
70-74	A-	3.5	8.75	Good	First Class
65-69	B+	3.0	7.50	Good	
60-64	B	2.5	6.25	Above Average	
55-59	C+	2.0	5.00	Average	Second Class
50-54	C	1.5	3.75	Satisfactory	
40-49	C-	1.0	2.50	Exempted if aggregate is more than 50%	Pass Class
39 and below	F	0	0	Fails	Fail

1. Students has to score minimum 40% in ESE, 40 % in both CIA + ESE to pass in a course.
2. Students has to secure 50% aggregate to secure a pass in the semester

8. BRIEF HISTORY OF DEPARTMENT

Department of Computer Science and Engineering started of journey in the year 2009 to produce qualified Engineers for the society with variety of skills. The department offers the following degrees Bachelor of Technology, Master of Technology, and Doctor of Philosophy in the areas of Computer Science and Engineering and Information Technology. Over the decade the department has inducted faculties to collectively pooled resources who can train the students in Artificial Intelligence, Machine learning, Computer Vision, Algorithms design, Cryptography, Computer Networking, Data mining, Data science, BIG DATA, Digital Image Processing, text mining, knowledge representation, soft computing, Cloud computing, etc.. The department from its inception has been keen on setting up labs for the students at present the labs infrastructure for the students are Tannenbaum lab, High Performance computing Lab, Bring your Own Device lab, Machine learning lab, CISCO Networking Lab, Red Hat Linux lab, specifically, for the students to be prepared for the lab curriculum and their research.

The department periodically conducts hands-on workshop on recent technology like Internet of Things, Cloud computing, Machine learning so that the students are connected with current and technologies. The department imparts teaching in Holistic method, where students who are trained under holistic education will be better citizens of Nation. The main educational goal is to prepare students for research and career in industry or in universities.

9. PROGRAMME OVERVIEW

The two year Post graduate program M. Tech in Information Technology started in 2011. The course was started mainly to cater to the increasing demand for higher studies in the country. A growing intake with students from across the nation shows the popularity of the program.

The Department strives to give skills essential to practicing engineering professionals; it is also an objective to provide experience in leadership, management, planning, and organization. The department understands its role in developing and evaluating methods that encourage students to continue to learn after leaving the university. We believe that the student opportunities and experiences should lead to an appreciation of the holistic development of individual. We also try to pass to our students our passion for what we do, and to have the students comprehend that we also desire to continue to learn.

10. PROGRAMME OBJECTIVE

The Post graduate program aims to offer advanced knowledge in specific areas. Focus on research is a special feature of our program, in CHRIST(Deemed to be University) Faculty of Engineering where students are encouraged to undertake research level projects and have mandatory publications in national level conferences. Specific subjects for industry level skills are also offered for better employability.

11. TEACHING PEDAGOGY

- Team/Class room teaching.

- PowerPoint presentations and handouts.

- Simulated situations and role-plays.

- Video films on actual situations.

- Assignments.

- Case Studies.

- Exercises are solved hands on.

- Seminars

- Industry / Field visits.

- Information and Communication Technology.

- Project work.

- Learning Management System- Moodle

12. ASSESSMENT RULES AND DETAILS OF CIA (Continuous Internal Assessment):

Assessment is based on the performance of the student throughout the semester.

Assessment of each paper

- Continuous Internal Assessment (CIA) for Theory papers: 50% (50 marks out of 100 marks)
- End Semester Examination(ESE) : 50% (50 marks out of 100 marks)

Components of the CIA

CIA I :	Mid Semester Examination (Theory)	: 25 marks
CIA II :	Assignments	: 10 marks
CIA III :	Quizzes/Seminar/Case Studies/Project Work	: 10 marks
	Attendance	: 05 marks
	Total	**: 50 marks**

For subjects having practical as part of the subject

End semester practical examination	: 25 marks
Records	: 05 marks
Mid semester examination	: 10 marks
Class work	: 10 marks
Total	**: 50 marks**

Mid semester practical examination will be conducted during regular practical hour with prior intimation to all candidates. End semester practical examination will have two examiners an internal and external examiner.

❖ **Assessment of Project Work(Phase-II) and Dissertation**
  ▪ Continuous Internal Assessment:100 Marks

- ◆ Presentation assessed by Panel Members
- ◆ Assessed by Guide

- ▪ End Semester Examination:100 Marks
  - ◆ Viva Voce
  - ◆ Demonstration
  - ◆ Project Report
- ▪ Dissertation (Exclusive assessment of Project Report): 100 Marks

❖ **Assessment of Internship (M.Tech)**

All students should complete internship before 3rd semester. This component carries 2 credits.
- ▪ Continuous Internal Assessment:2 credits
 - o Presentation assessed by Panel Members

PROJECT EVALUATION

The project work carries a total marks of 200 out of which 100 marks is CIA and 100 marks is allotted for ESE. The following process is carried for continuous monitoring and evaluation of the student project work.

- Once the supervisors are allotted to the students, the students have to regularly meet the project supervisor.
- On project days, the project coordinator takes attendance at three slots and the students have to maintain a notebook to record the activities done during that day and get it signed by the supervisor.
- Within one month of the beginning of the eighth semester, a zeroth review will be conducted where students need to present their findings based on literature survey to the panel members which will consist of the supervisor, project coordinator and faculty experts. Only if the panel members accept the project to be considered as a final year project, it can be carried out otherwise the student group will be given two weeks to modify their idea and present again.
- One review in front of the panel consisting of supervisor, project coordinator and faculty experts will be conducted every month thus resulting in 3 reviews including the zeroth review. The students shall prepare a PowerPoint presentation and present it to the panel. Each review will be awarded marks and will be considered for final CIA evaluation. The guide lines for preparing the power point slides are issued to the students by the project coordinator.
- The third review will be considered as the final review and a model presentation for the external viva-voce presentation of the project so that students are ready.
- Following process is adopted for project report finalizing
  - o The Deanery has adopted a latex template for preparing the Project thesis report. Special one day training on latex and how to use the template will be given to the students by the faculty members.
  - o The project report approved by the guide will then be sent to the project coordinator by the respective guides.
  - o The project reports received by the project coordinator will then be forwarded to two internal reviewers for reviewing the report.
  - o The student has to incorporate the changes mentioned by the reviewers and the modified report will be sent by the respective guides to the project coordinator and only on the final approval from the project coordinator, the students can go ahead with the hard binding of the reports.

o The hard bound reports will then be signed by all the students, guide, head of the department, Dean and the external examiner.
- An end semester project viva voce is conducted with the panel of internal and external examiners. The external examiner from other institution / university is appointed by the controller of examinations

The project evaluation process is shown below:
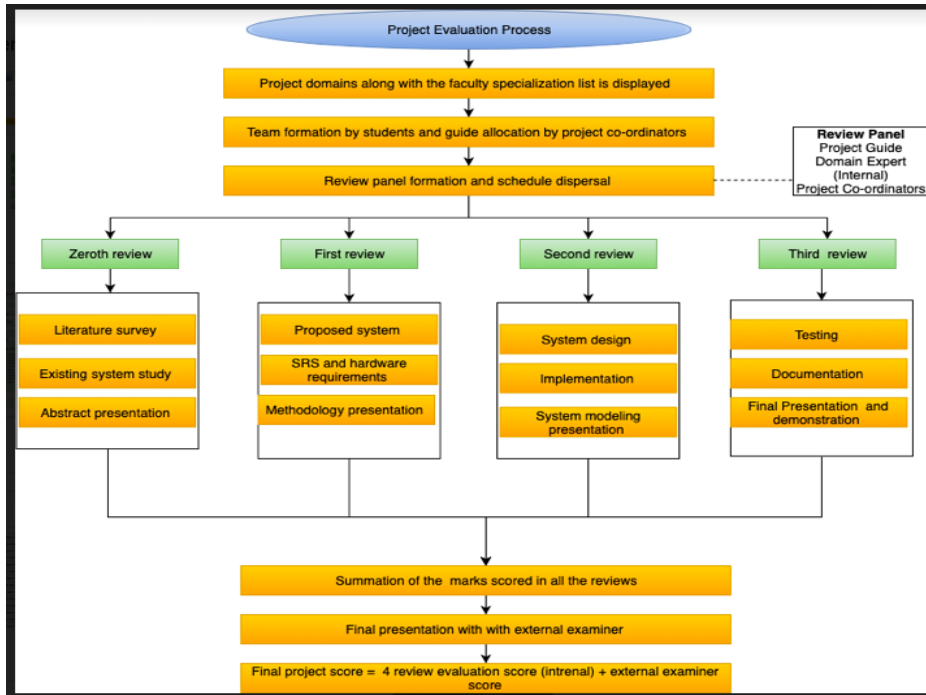
Process to assess individual and team performance

- Project group size varies from 2 to 4 members. The groups are formed by the students based on their area of interest.
- Thus students should be assessed both individually as well as in a team. For this, the department follows a process of reviews where the students will present for three times in front of the same panel members starting from the zeroth review.
- This will have continuity and the faculty members assess individual performance as well as team performance.
- A rubric is also formed for the project work which clearly mentions the criteria for assessing individual performance thus making the students aware of what they need to do in the beginning of the semester itself.

A sample review evaluation sheet is shown below where students are assessed individually based on their performance in the review presentation

Below diagram shows the individual and team assessment through a rubric:

Dimension	Score 1	Score 2	Score 3	Score 4
1. Contribution to the team project/work	• Does not collect any relevant information • No useful suggestions to address team's needs	• Collects information when prodded • Tries to offer some ideas, but not well developed and/or clearly expressed to meet team's needs	• Collects basic, useful information related to the project • Occasionally offers useful ideas to meet the team's needs	• Collects and presents to the team a great deal of relevant information • Offers well-developed and clearly expressed ideas directly related to the group's purpose
2. Taking responsibility	• Does not perform assigned tasks • Often misses meetings and, when present, does not have anything constructive to say • Relies on others to do the work	• Performs assigned tasks but needs many reminders • Attends meetings regularly but generally does not say anything constructive • Sometimes expects others to do his/her work	• Performs all assigned tasks • Attends meetings regularly and usually participates effectively • Generally reliable	• Performs all tasks very effectively • Attends all meetings and participates enthusiastically • Very reliable.
3. Valuing other team members and quality of interactions	• Often argues with team mates • Doesn't let anyone else talk • Occasional personal attacks and "put-downs" • Wants to have things done his/her way and/or does not listen to alternate approaches	• Usually does much of the talking • Does not pay much attention when others talk • Often assumes others' ideas will not work • No personal attacks and put-downs but sometimes patronizing	• Generally listens to others' points of view • Always uses appropriate and respectful language • Tries to make a definite effort to understand others' ideas	• Always listens to others and their ideas • Helps them develop their ideas while giving them full credit • Always helps the team reach a fair decision

13. QUESTION PAPER PATTERN:

End Semester Examination (ESE) :
Theory Papers:
    The ESE is conducted for 100 marks of 3 hours duration.
    The syllabus for the theory papers is divided into FIVE units and each unit carries equal weight age in terms of marks distribution.
    Question paper pattern is as follows.
    Two full questions with either or choice, will be drawn from each unit. Each question carries 20 marks. There could be a maximum of three sub divisions in a question. The emphasis on the questions is broadly based on the following criteria:
        50 % - To test the objectiveness of the concept
        30 % - To test the analytical skill of the concept
        20 % - To test the application skill of the concept
Laboratory / Practical Papers:
    The ESE is conducted for 50 marks of 3 hours duration. Writing, Execution and Viva – voce will carry weightage of 20, 20 and 10 respectively.

Mid Semester Examination (MSE) :
Theory Papers:
    The MSE is conducted for 50 marks of 2 hours duration.
    Question paper pattern; Five out of Six questions have to be answered. Each question carries 10 marks.

Laboratory / Practical Papers:
    The MSE is conducted for 50 marks of 2 hours duration. Writing, Execution and Viva – voce will carry weightage of 20, 20 and 10 respectively.

Holistic Education:
    End Semester Examination   25 Marks
    Participation   25 Marks

Total	**50 Marks**

14. CURRICULUM DESIGN PROCESS

CHRIST (Deemed to be University), a premier educational institution, is an academic fraternity of individuals dedicated to the motto of "Excellence and Service".

- Department of Computer Science and Engineering is under the deanery of Faculty of Engineering of CHRIST (Deemed to be University).
- The department offers B. Tech in Computer Science and Engineering program whose curriculum should be approved by the Board of Studies (BoS) and University Academic Council (AC).

The University has laid down a regulation for Curriculum design, review and Approval which is as below:

Board of Studies is the primary academic body responsible for initiating all or any proposal concerning academic matters of the University including but not limited to

- Program structure
- Development and review of curriculum
- Syllabus
- Question paper pattern
- Question paper standards
- Examination systems
- Internal assessments
- Student development
- Teaching methodology
- Pedagogy
- Appointment of examiners
- Introduction of new programs/courses etc.

1. There shall be one Board of Studies (BoS) for each academic department of the University.
2. The Board of Studies of each department shall consist of:
   a. Dean of Faculty/Head of the Department – Chairperson.
   b. All Professors, Associate Professors, and Assistant Professors of the department.
   c. Two members from teaching profession (outside the University) of the specialization not below the rank of Associate Professor, nominated with the approval of the Academic Council.
   d. Up to two members from the Industry / Entrepreneurs, nominated with the approval of the Academic council.
   e. Chairperson may nominate one of the faculty members of the department to be the Secretary of Board of Studies.
3. The term of the nominated members shall be two years and they are eligible for re-nomination.
4. Meeting of Board of Studies may be convened as and when needed but shall be held at least once in a year.
5. The quorum for the meeting of Board of Studies shall be two-third of the total membership of the Board of Studies of the Department.
6. The functions of Board of Studies are:

a. Preparation of syllabi for various program keeping in view the objectives of the program, interest of the stakeholders, and the level of knowledge expected of the subject. The syllabus must be as detailed as possible with breakup of topics and sub topics to enable meaningful preparation of course plan, and propose up-to-date suggested reading and reference books/material with author and publisher information.

b. Review of curriculum periodically for updating and revision according to changes in theory and practices from time to time.

c. Suggest innovative teaching practices and evaluation methods.

d. Suggest procedure for continuous internal assessment of students.

e. Recommend panel of examiners for approval by the Academic Council.

f. Propose introduction of new undergraduate, postgraduate and pre-doctoral, Doctoral, Diploma and Certificate program along with details of program structure, curriculum, and duration, for consideration by the Academic Council.

g. Coordinate research, teaching, extension and other academic activities relating to the department.

h. Suggest panel of experts to be nominated to the Board of Studies.

i. Suggest co-curricular activities for student development including holistic education materials.

j. Suggest value-added program for improving the quality standard of the students.

k. Suggest methods of enhancing quality of teaching and teacher training program.

l. Review and suggest ways to enhance the quality and quantity of research and publications by students and faculty.

m. Review and suggest modes of increasing external research projects and consultancies.

n. Review and suggest measures to improve the quality of Refresher Courses, Quality Improvement Program (QIP), Seminars, Conferences, and Workshops relating to the Department.

o. The Academic Council may direct any other functions, as it may deem necessary
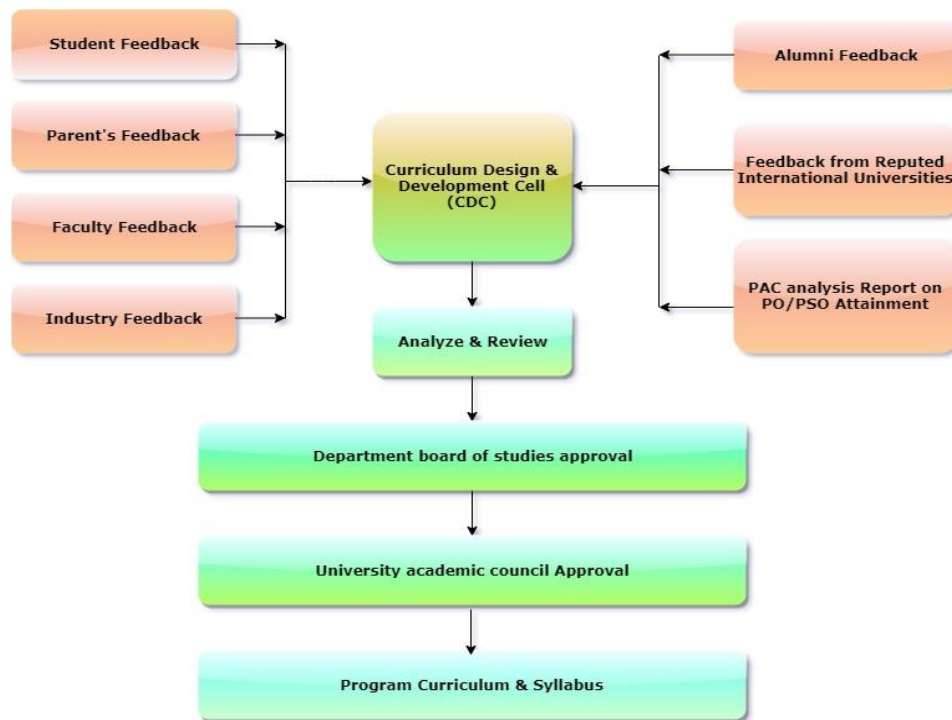
Figure 1 : Flow Chart for Curriculum Design Process

The Department of Computer Science and Engineering follows the following process for curriculum design:

1. The Head of the Department (HoD) in consultation with the Department Advisory Committee (DAC) nominates a BOS in-charge for the department.
2. In consultation with the BOS in-charge, the HoD formulates a Curriculum Design & Development Cell for the department (CDC). The CDC consists of professors, senior teachers with the HoD as the chairperson. The objective of the CDC is to review the curriculum and suggest recommendations every year to the BOS.
3. Meeting of the CDC Members may be convened as and when needed but should be held at least thrice in a year.
4. The CDC members will consolidate the feedback collected from all the stakeholders including students, faculty members, parents, alumni, employers, syllabus of reputed international universities and the entire course exit surveys collected in an academic year and analyze the feedbacks.
5. In consultation with Program Coordinator, HoD will formulate Program Assessment committee (PAC). PAC consists Program Coordinator, Domain Expert for each domain of Courses, two Associate professors and two assistant professor as its members and Program coordinator will be chair person.
6. The Program Assessment Committee (PAC) analyses the results which includes both direct and indirect assessment and submits a report which includes either an action plan in case of non PO/PSO attainment or a target increment in case of PO/PSO attainment to the CDC for their review. Analysis is done for attaining the PO/PSO's through the curriculum.
7. The CDC members then review the analysis of the PAC as well as review the feedbacks collected on the curriculum from the various stakeholders and provide their recommendations to the BOS on HOD's approval.
8. On the approval of the Board of Studies, the final approval of the curriculum is done by the academic council of the University.

State the process used to identify extent of compliance of the curriculum for attaining the Program Outcomes and Program Specific Outcomes

The following steps abstract the process of curriculum design and approval for the entire program:

- The curriculum is approved by the Board of Studies (BOS) which is held once every year in the month of either January/February.
- Before the BOS meeting, the department Curriculum Design & Development Cell (CDC) reviews all the feedbacks collected from the students, alumni, parents, recruiters and the faculty members and also analyze the PO and PSO attainment report submitted by PAC.
- The PO and PSO attainment with direct and indirect assessment is done by the PAC and the shortcomings, if any, are identified and recommended for consideration to the CDC.
- The CDC summarizes all the analysis and submit their recommendations for the approval of the BOS in the subsequent academic year.
- They are documented in the action plan of each PO/PSO and at the course level and reviewed every academic year for its attainment.

To satisfy the extent of compliance of curriculum for attaining the POs and PSOs, Course Outcomes for each subject in the programme is identified and each Course Outcome is mapped with POs and PSOs with the correlation level and attained the extent of compliance of the curriculum with the PO/PSO's.

- The curriculum is categorized based on the broader domains like basic sciences, engineering sciences, humanities and social sciences, program core, program electives, open elective, projects, seminars, internships etc.
- Each category is then mapped to the PO/PSO based on the courses from that category getting mapped to the PO/PSO's.
- This mapping gives us an idea where the PO/PSO are not getting mapped or getting mapped at a lower extent which allows the CDC to brainstorm on the categories on which curriculum needs to be improved.

Following is the process used to categorize the curriculum into broader domains and further mapped to PO/PSO's:
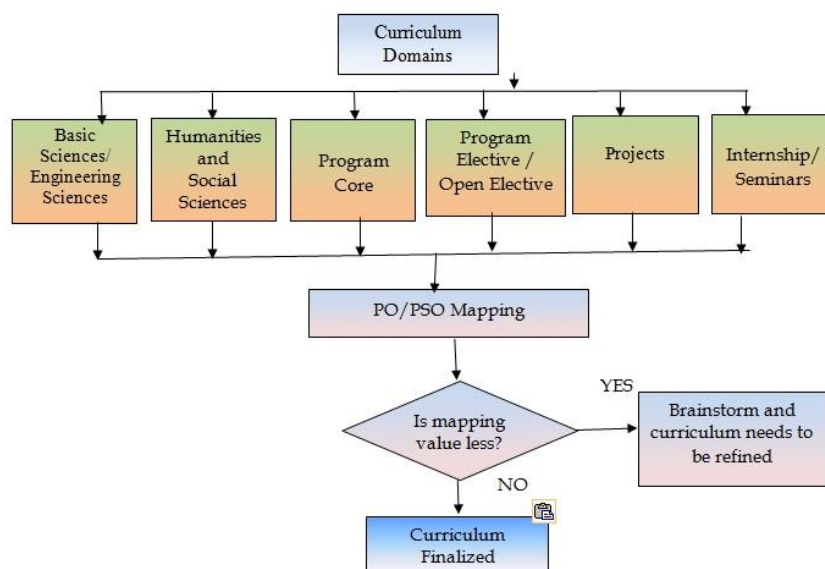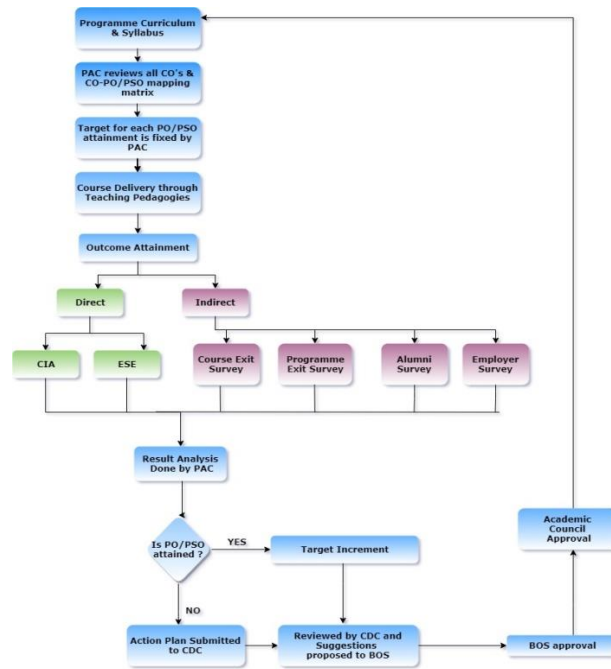
Figure 3: PO/PSO Attainment & Target Setting Process

Extent of compliance calculation is also analyzed through various feedback collected from various stakeholders. The following feedbacks are collected as part of indirect assessment of PO/PSO

Alumni Feedback
- The feedback regarding their adaptability to the industry or higher studies is taken and analyzed for further improvement of PO/PSO attainment.
- This feedback is also used as inputs in the curriculum development and design.

Student Feedback
- The feedback from students is collected for every course as well as at the end of the program. This feedback is analyzed for CO attainment of each course as well as in PO/PSO attainment.
- This feedback is also used as inputs in the curriculum development and design.

Employer Feedback
- This feedback is collected to enhance the program curriculum and allows us to understand where the PO attainment can be improved and thus helps in improved attainment.
- This feedback is also used as inputs in the curriculum development and design

Parent Feedback
- Parents are important stakeholders in any educational institution. This feedback is taken to survey the parent community as far as PO/PSO attainment is concerned.

15. LIST OF COURSES FOCUSSING ON EMPLOYABILITY/ ENTREPRENEURSHIP / SKILL DEVELOPMENT

Entrepreneurship	Employability	Skill Development
MTCS112 - Professional Practice - I: Teaching Skills, Laboratory Skills and other professional activities and Research Methodology Skills. MTCS213 - Professional Practice - II: Entrepreneurship Skills and Presentation Skills. MTCS121-Research Methodology and IPR: Research Methodology Skills. MTCS111/ MTCS212 Audit course 1/2: Audit courses	MTITDA131-Advances in Database Management systems-Advanced Database skill MTITDA133- Advanced Data Mining- Data Analytics skill MTITDA134- Statistical Foundations for Data Science- Data Analytical skill MTITDA231- Big data Analytics- Real time Data Analytical skill MTITDA232- Machine Learning- Data Analytical skill MTITDA241E02- Data Visualization Techniques- Data Analytical skill MTITDA241E04- Social and web media Analytics- Real time Data Analytical skill MTITDA241E05- Massive graph analysis- Real time Data Analysis skill MTITDA242E01- Internet of Things- Application design skill MTCS381: Internship: Industry based training 8 months MTCS382/483Dissertation Phase –I & II : Project implementation on advanced topics MTITDA242E03- Predictive analytics- Data Analysis skill MTITDA343E01-Real Time Data Analytics- Data Analytics skill MTITDA343E02-Big Data Analytics for IoT- Real time problem solving skill MTITDA343E04-Image and Video Analytics- Application development skill MTITDA343E07- NoSql Database- Application	MTITDA132- Advanced Artificial Intelligence- R & D MTITDA241E01- Advanced Digital Image Processing- R & D MTITDA242E02- Deep and Reinforcement Techniques- R&D MTITDA242E04- Pattern Recognition- R & D MTITDA242E05- Optimization Techniques- R & D MTITDA343E03-Natural Language Processing- R & D MTITDA343E05-Scientific Computing- R & D MTITDA343E06-Matrix Computations- R & D MTITDA343E07- NoSql Database-

	development skill			

16. LIST OF COURSES FOCUSSING ON REGIONAL NEEDS, NATIONAL NEEDS AND GLOBAL NEEDS

Identification of local needs	Identification of regional needs	Identification of national needs	Identification of global needs	Supporting Evidences / Documents
MTCS112 - Professional Practice - I: Teaching Skills, Laboratory Skills and other professional activities and Research Methodology Skills. MTCS111/ MTCS212 Audit course 1/2: Audit courses, MTCS213 - Professional Practice - II: Entrepreneurship Skills and Presentation Skills, MTCS381: Internship: Industry based training 8 months	MTCS112 - Professional Practice - I: Teaching Skills, Laboratory Skills and other professional activities and Research Methodology Skills. MTCS111/ MTCS212 Audit course 1/2: Audit courses, MTCS213 - Professional Practice - II: Entrepreneurship Skills and Presentation Skills MTCS232: Data Science: Data analytics skill MTCS382/483Dissertation Phase –I& II : Project implementation on advanced topics MTCS141E01- Advanced Software Testing : Testing skill MTCS141E02- Object Oriented System Design: design skill MTCS141E03- Software Project Management:	MTCS112 - Professional Practice - I: Teaching Skills, Laboratory Skills and other professional activities and Research Methodology Skills. MTCS111/ MTCS212 Audit course 1/2: Audit courses, MTCS213 - Professional Practice - II: Entrepreneurship Skills and Presentation Skills MTCS345E04- Natural Language Processing: R & D MTCS345E05-Bio Informatics: R & D MTCS345E07- Advanced Computer Architecture system architecture skill MTIT133- Mathematical Foundation for Information Science: mathematic fundamentals skill MTIT241E04-	MTCS112 - Professional Practice - I: Teaching Skills, Laboratory Skills and other professional activities and Research Methodology Skills. MTCS111/ MTCS212 Audit course 1/2: Audit courses, MTCS213 - Professional Practice - II: Entrepreneurship Skills and Presentation Skills MTCS345E02- Advanced Artificial Intelligence: R & D MTCS345E03- Pattern Recognition: R & D MTCS345E04- Natural Language Processing: R & D MTCS345E05-Bio Informatics: R & D	Bangalore being the IT hub, companies look post graduate students with stronger domain knowledge for roles in emerging technologies such as AI, Robotics and MI. Focus on Data Science,IoT AI and computer vision Arena provides the scope for CSE Post Graduates. Most of the MNC's are having their Asia Pacific operations in India. Since the focus of businesses, especially in the technology sector, shifting to emerging fields , demands for talents in such niche areas has grown at a faster pace, opening of more opportunities for PG students. According to the survey conducted

	software engineering skill MTCS141E04- Software Quality Assurance: quality estimation and checking skill MTCS142E01-Big Data Analytics: Real time Data analytical skill MTCS142E02- Machine Learning- Self learning algorithms design skill MTCS142E04- Visualization Techniques: Pre and post processing skill MTCS142E05- Information Retrieval- Storage management skill MTCS243E01- Cloud Computing: efficient computation techniques	Computer Vision: R & D MTIT343E03-Deep and Reinforcement Techniques: R & D MTCS345E02- Advanced Artificial Intelligence: R & D MTCS345E03- Pattern Recognition: R & D		on the employment by Network World by IDG the following facts are being presented: The overall average salary for bachelor's degree graduates earning computer science degrees is projected to be $69,188 this year, according to the National Association of Colleges and Employers (NACE)(Source: https://www.nac eweb.org/job- market/compensa tion/stem-majors- projected-to-be- class-of-2019s-top- paid/). That is the second-highest starting salary, behind only engineering graduates, who are projected to earn $66,521. According to NACE survey top paid engineering graduate is Computer Science with annual package of $67,539(Source: Winter 2019 *Salary Survey*, National Association of Colleges and Employers) . Additionally, NACE reports that among the 2019 crop of new

				graduates, those majoring in computer science enjoyed the highest full-time employment rate (76%) within six months of their graduation.According to MIT Graduate survey report 2018, the percentage of students availing internship opportunities have consistently increased to 33% from 28% in the previous year. The percentage of students who have received an offer has also increased to 61% from 51% in the previous year. Top industries hiring MIT a graduate continues to be highest at 22% in the software sector compared to other domains. Top industries hiring MIT masters graduates in software sector stands at 12% making it the second highest recruitments. The percentage of PhD graduate seeking fulltime employment in industries has increased 59% from 51% in the previous year. Top industries hiring

				MIT PhD graduates in the software sector continues to be second highest at 10% (source: https://capd.mit.edu/sites/default/files/documents/MIT%20Employer%20Presentation-4-1-18SelectSlides.pdf). Job industries are giving raising preference to Post graduate students and research scholars for cutting edge work in research and development. At IIT madras, the percentage of Post graduate placements continues to rise at 71%(2017-18) from 63% in the previous year. Similarly the percentage of research scholar placements has continues to rise at 36%(2017-18) from 23% in the previous year. All the four buckets under which companies were slotted for campus placements (analytics, finance, core, computer science) continues to prefer PG and PhD students. (Source: httpts:\\www.ind

				iatoday.in>story:June 11, 2018). According to this survey Karnataka was the second highest state with maximum hiring activity after Maharashtra in the year 2018-19. Candidates from engineering domain were hired at 23% which is maximum across all the domains. Among the engineering courses, CS/IT continues to secure highest employability percentage at 62%. Bangalore posses to be the number one city with highest employability. Karnataka stands at number one in the areas of learning agility and self determination in stateswise availability of skills. (source: India skills report 2019).As per the survey conducted by CDC team, the preference for opting CS/IT discipline as well as employability and opportunities continues to be highest in Software sector.
M.Tech –IT(2020-2022)				

17. STAKE HOLDERS FEEDBACK

Category	Total Number of Requests	Total Number of Responses	Excellent	Good	Satisfactory	Average	Need to Improve
Alumni	**20**	**20**	**11**	**9**	**0**	**0**	**0**
Student	**250**	**203**	**58**	**82**	**52**	**9**	**2**
Industry	**20**	**21**	**11**	**10**	**0**	**0**	**0**
Parent	**20**	**19**	**16**	**3**	**0**	**0**	**0**
Teachers	**45**	**42**	**40**	**2**	**0**	**0**	**0**

18. COURSE STRUCTURE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.TECH in IT(Data Analytics)

COURSE STRUCTURE

M.TECH IT (Data Analytics) – (FOR 2020-2022 BATCH)

I SEMESTER

Sl. No	Course Code	Course Name	Hours			Total Marks	Credits			Total Credits
			L	T	P		L	T	P	
THEORY										
1	MTCS131	Research Methodology and IPR	3	0	0	100	3	0	0	3
2	MTITDA131	Advances in Database Management systems	3	0	0	100	3	0	0	3
3	MTITDA132	Advanced Artificial Intelligence	3	0	0	100	3	0	0	3
4	MTITDA133	Advanced Data Mining	3	0	0	100	3	0	0	3
5	MTITDA134	Statistical Foundations for Data Science	3	0	0	100	3	0	0	3
6	HE171	Holistic Education-I	1	0	0	-	1	0	0	1
PRACTICAL										
7	MTITDA151	Advances in Database Management systems Lab	0	0	4	50	0	0	2	2
8	MTITDA152	Advanced Data Mining Lab	0	0	4	50	0	0	2	2
9	MTCS111	Audit Course -1	2	0	0	-	0	0	0	0
10	MTCS112	Professional Practice-I	0	0	2	50	0	0	1	1
		TOTAL	**18**	**0**	**10**	**650**	**16**	**0**	**5**	**21**

II SEMESTER

Sl. No	Course Code	Course Name	Hours			Total	Credits			Total
			L	T	P	Marks	L	T	P	Credits
THEORY										
1	MTITDA231	Big data Analytics	3	0	0	100	3	0	0	3
2	MTITDA232	Machine Learning	3	0	0	100	3	0	0	3
3	MTITDA241	Elective – I	3	0	0	100	3	0	0	3
4	MTITDA242	Elective – II	3	0	0	100	3	0	0	3
5	HE271	Holistic Education-II	1	0	0	-	1	0	0	1
PRACTICAL										
6	MTITDA251	Big data Analytics Lab	0	0	4	50	0	0	2	2
7	MTITDA252	Machine Learning Lab	0	0	4	50	0	0	2	2
8	MTCS212	Audit Course-2	2	0	0	-	0	0	0	0
9	MTCS213	Professional Practice-II	0	0	2	50	0	0	1	1
		TOTAL	**15**	**0**	**10**	**550**	**13**	**0**	**5**	**18**

III SEMESTER

Sl. No	Course Code	Course Name	Hours			Total Marks	Credits			Total Credits
			L	T	P		L	T	P	
1	MTITDA343	Elective – III	3	0	0	100	3	0	0	3
2	MTCS361	Elective – IV(Global)	3	0	0	100	3	0	0	3
3	MTCS381	Internship	0	0	4	-	0	0	2	2
4	MTCS382	Dissertation Phase –I	0	0	20	200	0	0	10	10
		Total	**6**	**0**	**24**	**400**	**6**	**0**	**12**	**18**

IV SEMESTER

Sl. No	Course Code	Course Name	Hours			Total Marks	Credits			Total Credits
			L	T	P		L	T	P	
1	MTCS483	Dissertation Phase – II	0	0	32	200	0	0	16	16
		Total	**0**	**0**	**32**	**200**	**0**	**0**	**16**	**16**

LIST OF ELECTIVES

Sl. No	Course Code	Course Name	L	T	P	Total Marks	L	T	P	Total Credits
			Hours			**Total**	**Credits**			**Total**
			L	**T**	**P**	**Marks**	**L**	**T**	**P**	**Credits**
MTITDA241- ELECTIVE – I									
1	MTITDA241E01	Advanced Digital Image Processing	3	0	0	100	3	0	0	3
2	MTITDA241E02	Data Visualization Techniques	3	0	0	100	3	0	0	3
3	MTITDA241E03	Advanced Soft Computing	3	0	0	100	3	0	0	3
4	MTITDA241E04	Social and web media Analytics	3	0	0	100	3	0	0	3
5	MTITDA241E05	Massive graph analysis	3	0	0	100	3	0	0	3
MTITDA242- ELECTIVE – II									
1	MTITDA242E01	Internet of Things	3	0	0	100	3	0	0	3
2	MTITDA242E02	Deep and Reinforcement Techniques	3	0	0	100	3	0	0	3
3	MTITDA242E03	Predictive analytics	3	0	0	100	3	0	0	3
4	MTITDA242E04	Pattern Recognition	3	0	0	100	3	0	0	3
5	MTITDA242E05	Optimization Techniques	3	0	0	100	3	0	0	3
MTITDA343- ELECTIVE – III									
1	MTITDA343E01	Real Time Data Analytics	3	0	0	100	3	0	0	3
2	MTITDA343E02	Big Data Analytics for IoT	3	0	0	100	3	0	0	3
3	MTITDA343E03	Natural Language Processing	3	0	0	100	3	0	0	3
4	MTITDA343E04	Image and Video Analytics	3	0	0	100	3	0	0	3
5	MTITDA343E05	Scientific Computing	3	0	0	100	3	0	0	3
6	MTITDA343E06	Matrix Computations	3	0	0	100	3	0	0	3
7	MTITDA343E07	NoSql Database	3	0	0	100	3	0	0	3
MTCS111- AUDIT COURSE -1									
1	MTCS111E01	English for Research Paper Writing	2	0	0	-	0	0	0	0
2	MTCS111E02	Disaster Management	2	0	0	-	0	0	0	0
3	MTCS111E03	Sanskrit for Technical Knowledge	2	0	0	-	0	0	0	0
4	MTCS111E04	Value Education	2	0	0	-	0	0	0	0
MTCS212- AUDIT COURSE -2									
1	MTCS212E01	Constitution of India	2	0	0	-	0	0	0	0
2	MTCS212E02	Pedagogy Studies	2	0	0	-	0	0	0	0
3	MTCS212E03	Stress Management by Yoga	2	0	0	-	0	0	0	0
4	MTCS212E04	Personality Development through Life Enlightenment Skills.	2	0	0	-	0	0	0	0

CREDIT DETAILS	
Semester	M.Tech- IT(Data Analytics)
I	21
II	18
III	18
IV	16
TOTAL CREDITS	73

19. DETAILED SYLLABUS

MTCS131	RESEARCH METHODOLOGY AND IPR	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

- To orient the student to make an informed choice from the large number of alternative methods and experimental designs available.
- To enable the student to present a good research proposal.
- To familiarize the student with the nature of research and scientific writing

To empower the student with the knowledge and skills they need to undertake a research project, to present a conference paper and to write a scientific article

Prerequisite

CS431 - PROBABILITY AND QUEUING THEORY
MTCS133 - Advanced Algorithms

Course Outcomes

Understanding the research methodology and defining the research problem	L1
Apply the statistical techniques such as scaling, skewness, correlation, and association techniques to process the data	L2
Analyze the algorithm to find the order of growth of best, worst and average cases.	L3
Analyze the population using sampling fundamentals, variance and covariance methods	L3
Evaluate the research results and presenting the research report	L4

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3	2	3					1	1		
CO3	3	3	2	3	2				1	1		
CO4	3	3	3	3	2				1	1		
CO5	1	1							2	2		1

Syllabus

Unit – I	RESEARCH METHODOLOGY	9	0	0

An Introduction Meaning of Research, Objectives of Research, Motivation in Research, Types of Research , Research approaches ,Research Method versus Methodology ,Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, problem Encountered by Researchers in India.Defining the Research Problem: Definition of Research Problem, Selecting the Problem, Necessity of Defining the Problem Technique Involved in Defining a Problem

Unit – 2	MEASUREMENT AND SCALING TECHNIQUE	9	0	0

Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques. Processing and Analysis of Data: Processing Operations, Some Problems in Processing, Elements /Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion Measures of Asymmetry (Skewness), Measures of Relationship, Partial Correlation, Association in case of Attributes, Other Measures.

Unit – 3	ANALYSIS OF ALGORITHM	9	0	0

The role of algorithm in computing –Insertion sort–Analyzing and designing algorithms – growth of functions–introduction to NP –completeness.

Unit – 4	SAMPLING FUNDAMENTALS	9	0	0

Need for Sampling, Some Fundamental Definitions, Central Limit Theorem, Sampling Theorem, Sandler's A-test, Concept of Standard Error, Estimation, Estimating the Population Mean, Estimating the Population Proportion, Sample size and its Determination, Determination of Sample Size through the Approach, Based on Precision Rate and Confidence Level, Determination of Sample Size through the Approach, Based on Bayesian Statistics. Analysis of Variance and Covariance: Analysis of variance (ANOVA), basic principles, technique, setting up analysis of variance table, short cut method for one- way ANOVA, coding method, two-way-ANOVA, ANOVA in Latin-Square-Design, Analysis of Co-variance(ANOCOVA), technique, assumption in ANOCOVA.

Unit – 5	INTERPRETATION AND REPORT WRITING	9	0	0

Meaning of Interpretation, Technique of Interpretation: Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing a Research Report, Case study .

Text Books

1. Kothari C.R. , Research Methodology – Methods and Techniques, New Age International , New Delhi, (reprint 2011)
2. Montgomery, Douglas C., Design and Analysis of Experiments, Willey India, 2007
3. Montgomery, Douglas C. &Runger, George C. ,Applied Statistics & Probability for Engineers, Wiley India , 2010.

Reference Books

1. Krishnaswamy, K.N. Sivkumar , AppaIyer and Mathiranjan M., Management Research Methodology: Integration of Principles, Method and Techniques,Pearson Education, New Dehli, 2009
2. Charlie Catlett, Wolfgang Gentzsch, LucioGrandinetti, Gerhard Joubert, and José Luis Vasquez-Poletti, Cloud computing and big data , Published/Distributed:Amsterdam : Washington, DC : IOS Press, [2013]

Course Designer(s)

Dr Sundara Pandiyan

Course Reviewer

Dr Samiksha Shukla

MTITDA131	ADVANCES IN DATABASE MANAGEMENT SYSTEMS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

Prerequisite
Database systems

Course Outcomes	
Explain the fundamentals of Database systems	L2
Illustrate the basic concepts of SQL	L3
Examine the advanced concepts of SQL	L4
Examine the concepts of distributed database	L4
Demonstrate the fundamentals of data warehousing	L2

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	1	2							
CO2			2	1								
CO3			2	1	2							
CO4	2			1	2							
CO5	2		2	1	2							

Syllabus

Unit – I	INTRODUCTION AND CONCEPTUAL MODELING	9	0	0

Database Management systems Application of DBMS, Advantages of DBMS-ER model, Components of E-R diagram, Cardinality – Relational databases, Converting ER Diagram into Relations/Tables, Normalization

Unit – 2	SQL Fundamentals	9	0	0

Structure Query Language, Creating Tables, Modifying Structure of table , The SELECT statement, DELETE and UPDATE, Smart table design , ALTER

Unit – 3	SQL Fundamental -2	9	0	0

Advance Select , Multi-table database design, Joins and Multi-table operations, sub queries, constraints, views and transactions , security

Unit – 4	DISTRIBUTED DATABASE	9	0	0

Distributed Databases Vs. Conventional Databases-Architecture-Fragmentation-Query Processing-Transaction Processing-Concurrency Control-Recovery.

Unit – 5	DATA WAREHOUSING	9	0	0

Introduction to Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Data Warehousing to Data Mining, KDD process.

Text Books

1. Abraham Silberschatz, Henry. F. Korth, S.Sudharsan, "Database System Concepts", 6th Edition. Tata   McGraw Hill, 2010 .
2. Carlos Coronel & Steven Morris, "Database Systems: Design, Implementation, & Management", February 4, 2014.

Reference Books

1. PaulrajPonniah, "Data Warehousing Fundamentals", Wiley-Interscience Publication, 2003.

Course Designer(s)
Praveen Naik
Course Reviewer
Dr Manohar M

MTITDA132	ADVANCED ARTIFICIAL INTELLIGENCE	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

This course provides a strong foundation of fundamental concepts in Artificial Intelligence. To provide an empirical evidence and the scientific approach applying Artificial Intelligence techniques for problem solving using probabilistic, fuzzy, statistical and Deep Learning Models.

Prerequisite

Basic Python / R Programming / Probability

Course Outcomes

Demonstrate the concepts and features of agents, environments and uniformed search strategies.	L3
Understand inference using Bayesian Networks, Hidden Markov Models as an approach to Probabilistic Reasoning	L2
Experiment the Fuzzy Logic Systems to Neural Network Architectures	L3
Compare and contrast performance of different Statistical learning methods used in machine learning	L2
Explore Deep Learning models to image and text processing application	L3

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3	2						1	1		
CO3	3	3	2	3	2				1	1		
CO4	3	3	3	3	2				1	1		
CO5	3	3	2	2								

Syllabus

Unit – I	INTRODUCTION	L-9	T-0	P-0

Intelligent Agents – Agents and environments - Good behaviour – The nature of environments – structure of agents - Problem Solving agents – Acting under uncertainty – Inference using full joint distributions; –Independence; Bayes' rule and its use; –The Wumpus world revisited.

Unit – 2	SEARCHING TECHNIQUES	9	0	0

Problem-Solving Agents, Well-defined problems and solutions, Formulating problems, Real-world problems. Uninformed Search Strategies, Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies, Greedy best-first search, A* search: Minimizing the total estimated solution cost, Heuristic Functions. The effect of heuristic accuracy on performance. Beyond Classical Search, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces.

Unit – 3	GAME PLAYING	9	0	0

Games, Optimal Decisions in Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha Beta Pruning, Move ordering, Imperfect Real-Time Decisions, Cutting off search, Forward pruning. Stochastic Games, Evaluation functions for games of

Unit – 4	STATISTICAL AND REINFORCEMENT LEARNING	9	0	0

Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data - Learning with hidden variable - EM algorithm - Instance based learning - Reinforcement learning – Passive reinforcement learning - Active reinforcement learning - Generalization in reinforcement learning.

Unit – 5	DEEP LEARNING	9	0	0

Convolutional Neural Networks, Motivation, Convolution operations, Pooling, Image classification, Modern CNN architectures, Recurrent Neural Network, Motivation, Vanishing/Exploding gradient problem, Applications to sequences, Modern RNN architectures, Tuning/Debugging Neural Networks, Parameter search, Overfitting, Visualizations, Pretrained Models

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education, 2014.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw-Hill, 2012.
3. Francois Chollet "Deep Learning with Python", 1st Edition Manning Publication, 2018

Reference Books

1. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", 1st Edition, Harcourt Asia Pvt. Ltd., 2012.
2. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", 6th Edition, Pearson Education / PHI, 2009.

Course Designer(s)

Vinai George Biju

Course Reviewer

Dr. Samiksha Shukla

			Hours			Credits			
			L	T	P	L	T	P	C
MTITDA133	**ADVANCED DATA MINING**		3	0	0	3	0	0	3

Preamble

Data mining is one of the most advanced fields of Computer Science and Engineering. This field makes use of the applications of Mathematics, Statistics and Information Technology in discovering and prediction of new information and knowledge from largely available data. It is a new evolving interdisciplinary area of research and development which has created interest among scientists of various disciplines like Computer Science, Mathematics, Statistics, and Information Technology and so on. This course titled, "Advanced Data Mining," involves learning a collection of techniques for extracting and discovering new patterns and trends in large amounts of data. This course will also provide a hands-on introduction to the Advanced Data Mining concepts with an emphasis on features useful to Engineering, Business and Management.

Prerequisites

Data Structures and Algorithms, Probability and Statistics.

Course Outcomes

1.	Explain the fundamental issues involved in the use of the training/test methodology, cross-validation and the bootstrap to provide accuracy assessments.	L1
2.	Demonstrate accurate and efficient use of classification and related data mining techniques, using Python Programming for the computations.	L2
3.	Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from the theory that underpins clustering and related data mining methods.	L3
4.	Understand and explain ideas of source and target sample, and their relevance to the practical application relevance to the society of proximity based and clustering methods and other data mining techniques.	L4
5.	Design data mining solutions to analyze real-world data sets.	L5

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1										
CO2		2										
CO3	3	2		3								
CO4	3	2	3				2				2	
CO5	3	3	3	3	3		2				2	

Syllabus

Unit – I	Introduction	9	0	0

A multidimensional Data Model, Data preprocessing, Data cleaning, Data integration and Transformation, Correlation analysis and Data Reduction

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Binary Attributes, Numeric Data, Ordinal Attributes, Dissimilarity for Attributes of Mixed Types.

Unit – 2	Pattern Mining	9	0	0

Mining Frequent Patterns-basic concepts-apriori principle, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining, Mining High-Dimensional Data and Colossal Patterns.

Unit – 3	Classification Methods	9	0	0

Bayesian Belief Networks, Classification by Backpropagation, Support Vector Machines, kNearest-Neighbour Classifiers, Genetic Algorithms, Rough Set Approach, Fuzzy Set, Model Evaluation and Selection, Approaches, Techniques to Improve Classification Accuracy.

Unit – 4	Cluster Analysis	9	0	0

k-Means: A Centroid-Based Technique, k-Medoids, Hierarchical Methods, Probabilistic Model-Based Clustering, Clustering High-Dimensional Data, Clustering Graph and Network Data, Evaluation of Clustering.

Unit – 5	Outlier Detection	9	0	0

Proximity-Based Methods, and Clustering-Based Methods, Outlier Detection in HighDimensional Data.

Case Study: Data Mining Applications: Recommender Systems, Intrusion Detection and Prevention and Financial Data Analysis.

Text Books

1. Han J. &Kamber, M, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.

Reference Books

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining" Pearson, First Edition, 2014.
2. Mohammed J.Zaki, Wagneermeira, "Data Mining and Analysis: Fundamental concepts and algorithms", First Edition, Cambridge University Press India, 2015.
3. Ian H. Witten, &Eibe Frank, "Data Mining –Practical Machine Learning Tools and Techniques", 3rd Edition, Elesvier, 2011.

Course Designer(s)

Sujatha A K

Course Reviewer

Dr. Manohar M

MTITDA134	STATISTICAL FOUNDATIONS FOR DATA SCIENCE	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

The students will learn basics of statistics applied in Data Science

Prerequisite

Probability and Queuing Theory

Course Outcomes

CO	Level
Demonstrate the concepts of discrete random variables and probability	L2
Illustrate the concepts of continuous random variables	L3
Conduct the experiment on joint probability distribution	L4
Discuss the fundamental concepts of statistical intervals	L1
Describe the basic concepts of single sample and two samples in statistical methods	L1

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	2								
CO2	2	1	2	2								
CO3	2		2	2				1				
CO4	2		2	2	1							
CO5	2		2	2								

Syllabus

Unit – I	**Discrete Random Variables and Probability**	9	-	-

The Engineering Method andStatistical Thinking, Probability, Sample space and events, Interpretation of probability, Conditional probability, multiplication and total probability, Bayes theorem, Random variables, Discrete Random Variables, Probability Distributions and probability mass functions, Cumulative DistributionFunctions, Mean and Variance of a Discrete, Random Variable, Binomial distribution

Unit – 2	**Continuous Random Variables and Probability Distributions**	9	-	-

Continuous Random Variables, Probability Distributions and Probability Density Functions, Cumulative Distribution Functions, Mean and Variance of a Continuous Random Variable, Continuous Uniform Distribution, Normal Distribution, Normal Approximation to the Binomial and Poisson Distributions, Exponential Distribution, Weibull Distribution

Unit – 3	**Joint Probability Distributions**	9	-	-

Two Discrete Random Variables, Multiple Discrete Random Variables, Two Continuous Random Variables, Multiple Continuous Random Variables, Covariance and Correlation, Bivariate Normal Distribution, Linear Combinations of Random Variables,

Unit – 4	**Random Sampling and Data Description, Statistical Intervals for a Single Sample**	9	-	-

Data Summary and Display, Random Sampling, Stem-and-Leaf Diagrams, Frequency Distributions and Histograms, Box Plots, Time Sequence Plots, Probability Plots, Introduction to Statistical Intervals for a Single Sample, Confidence Interval on the Mean of a Normal Distribution, Variance Known, Confidence Interval on the Mean of a Normal Distribution, Variance Unknown, Confidence Interval on the Variance and Standard Deviation of a Normal

Distribution, A Large-Sample Confidence Interval for a Population Proportion, A Prediction Interval for a Future Observation

Unit – 5	Tests of Hypotheses for a Single Sample, Statistical Inference for Two Samples	9	-	-

Hypothesis Testing, Tests on the Mean of a Normal Distribution, Variance Known, Tests on the Mean of a Normal Distribution, Variance Unknown, Tests on the Variance and Standard Deviation of a Normal Distribution, Tests on a Population Proportion, Inference For a Difference in Means of Two Normal Distributions, Variances Known, Inference For a Difference in Means of Two Normal Distributions, Variances Unknown, Inference on the Variances of Two Normal Distributions

Text Books

1. Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", Third edition, John Wiley & Sons, Inc., 2014
2. NinaZumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

Reference Books

1. Rao V Dukkipati, "Probability and Statistics for Scientists and Engineers", New Age International Publishers, First edition, 2012,
2. Ronald E Walpole, Raymond H Myers, Sharon L Myers, Keying E Ye, "Probability and Statistics for Engineers and Scientists", Ninth Edition, Pearson Education, 2013

Course Designer(s)

Mithun B N

Course Reviewer

Mahesh D S

MTITDA151	ADVANCES IN DATABASE MANAGEMENT SYSTEMS LAB	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	2	0	0	2	2

Preamble

List of Experiments

1. Study of all SQL commands
2. Implementation of PL/SQL Programs.
3. Implementation of Cursor, Trigger.
4. Implement the inventory control system with a reorder level
5. Develop a package for a bank to maintain its customer details
6. Develop a package for the payroll of a company
7. Implementation of IEEE/ACM paper
8. Implementation of Data Science Application Problems
9. Learning SPSS tool to implement research based concepts

Course Designer(s)

Praveen Naik

Course Reviewer

Dr Manohar M

MTITDA152	ADVANCED DATA MINING LAB	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	2	0	0	2	2

Preamble
Data mining is one of the most advanced fields of Computer Science and Engineering. This field makes use of the applications of Mathematics, Statistics and Information Technology in discovering and prediction of new information and knowledge from largely available data. It is a new evolving interdisciplinary area of research and development which has created interest among scientists of various disciplines like Computer Science, Mathematics, Statistics, and Information Technology and so on. This course titled, "Advanced Data Mining," involves learning a collection of techniques for extracting and discovering new patterns and trends in large amounts of data. This course will also provide a hands-on introduction to the Advanced Data Mining concepts with an emphasis on features useful to Engineering, Business and Management.

List of Experiments

1. Introduction to data mining tools
2. Analysis of the various datasets by using frequent pattern mining algorithms
3. Analysis of the various datasets by using clustering algorithms
4. Analysis of the various datasets by using classifier algorithms
5. Analysis of the various datasets by using outlier detection algorithms

Course Designer(s)
Sujatha A K

Course Reviewer
Dr Manohar M

		Hours			Credits			
MTCS111E02	**DISASTER MANAGEMENT**	L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble
1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Prerequisite
Nil

Unit – I	INTRODUCTION	4	0	0
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.				

Unit – 2	REPERCUSSIONS OF DISASTERS AND HAZARDS	4	0	0
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.				

Unit – 3	DISASTER PRONE AREAS IN INDIA STUDY OF SEISMIC ZONES	4	0	0
Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics				

Unit – 4	DISASTER PREPAREDNESS AND MANAGEMENT PREPAREDNESS	4	0	0
Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.				

Unit – 5	RISK ASSESSMENT DISASTER RISK	4	0	0
Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.				

Text Books
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

Reference Books
1. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
2. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep&Deep Publication Pvt. Ltd., New Delhi.

Course Designer(s)

Syllabus is taken from AICTE Model curriculum

Course Reviewer

MTCS111E03	SANSKRIT FOR TECHNICAL KNOWLEDGE	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects
4. enhancing the memory power
5. The engineering scholars equipped with Sanskrit will be able to explore the 6. huge knowledge from ancient literature

Prerequisite				
Nil				
Unit – I		8	0	0

Alphabets in Sanskrit, · Past/Present/Future Tense, · Simple Sentences

Unit – 2		8	0	0

Order · Introduction of roots · Technical information about Sanskrit Literature

Unit – 3		8	0	0

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

Text Books

"Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

Reference Books

"Teach Yourself Sanskrit" PrathamaDeeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

"India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Designer(s)

Syllabus is taken from AICTE Model curriculum

Course Reviewer

MTCS111E04	VALUE EDUCATION	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble

Understand value of education and self- development
Imbibe good values in students
Let the should know about the importance of character

Prerequisite

Nil

Unit – I		5	0	0

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

Unit – 2		5	0	0

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

Unit – 3		5	0	0

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

Unit – 4		5	0	0

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

Text Books

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

Reference Books

Course Designer(s)

Syllabus is taken from AICTE Model curriculum

Course Reviewer

MTCS112	PROFESSIONAL PRACTICE- I	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	2	0	0	2	1

Preamble

SUBJECT DESCRIPTION:

During the seminar session each student is expected to prepare and present a topic on engineering / technology, it is designed to:
- Review and increase their understanding of the specific topics tested.
- Improve their ability to communicate that understanding to the grader.
- Increase the effectiveness with which they use the limited examination time.

SUBJECT OBJECTIVE:

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews and intended to increase the score they earn on the upcoming exam above what they would otherwise earn.

This course is specially designed for the students of higher degree. It aims to train and equip the students towards acquiring competence in teaching, laboratory skills, research methodologies and other professional activities including ethics in the respective academic disciplines.

The course will broadly cover the following aspects:
- Teaching skills
- Laboratory skills and other professional activities
- Research methodology

For teaching suitable courses where strengthening in the training of the students is required will be identified and the student will be asked to prepare lectures on selected topics pertaining to the courses and present these lectures before a panel of faculty members. The student will also be required to prepare question papers which will test the concepts, analytical abilities and grasp in the subject. Wherever the laboratories are involved, students will also be asked to carry out laboratory experiments and learn about the use and applications of the instruments. The general guiding principle is that the students should be able to teach and participate in the undergraduate degree courses in his/her discipline in an effective manner. The students will also assist the faculty in teaching and research activities. The course will also contain the component of research methodology, in which a broad topic will be assigned to each student and he/ she is supposed to carry out intensive literature survey, data analysis and prepare a research proposal.

Each group will carry out many professional activities beside teaching and research. Such as, purchase of equipments, hardware, software and planning for new experiments and also laboratories etc. Along with these the students will also be assigned some well defined activities. The student is expected to acquire knowledge of professional ethics in the discipline.

Prerequisite
Nil
OPERATIONAL DETAILS

Head of the Department will assign a suitable instructor/faculty member to each student. Students and faculty members covering a broad area will be grouped in a panel consisting of 4-5 students and 4-5 faculty members.

Within one week after registration, the student should plan the details of the topics of lectures, laboratory experiments, developmental activities and broad topic of research etc in consultation with the assigned instructor/faculty. The student has to submit two copies of the written outline of the total work to the instructor within one week.

In a particular discipline, Instructors belonging to the broad areas will form the panel and will nominate one of them as the panel coordinator. The coordinator together with the instructors will draw a complete plan of lectures to be delivered by all students in a semester. Each student will present 3- 4 lectures, which will be attended by all other students and Instructors. These lectures will be evenly distributed over the entire semester. The coordinator will announce the schedule for the entire semester and fix suitable meeting time in the week.

Each student will also prepare one presentation about his findings on the broad topic of research. The final report has to be submitted in the form of a complete research proposal. The References and the bibliography should be cited in a standard format. The research proposal should contain a) Topic of research b) Background and current status of the research work in the area as evident from the literature review c) Scope of the proposed work d) Methodology e) References and bibliography.

A report covering laboratory experiments, developmental activities and code of professional conduct and ethics in discipline has to be submitted by individual student.

The panel will jointly evaluate all the components of the course throughout the semester and the mid semester grade will be announced by the respective instructor to his student.

A comprehensive viva/test will be conducted at the end of the semester jointly, wherever feasible by all the panels in a particular academic discipline/department, in which integration of knowledge attained through various courses will be tested and evaluated.

Wherever necessary and feasible, the panel coordinator in consultation with the concerned group may also seek participation of the faculty members from other groups in lectures and comprehensive viva.

Mid semester report and final evaluation report should be submitted in the 9th week and 15th week of the semester respectively. These should contain the following sections:

Section (A): Lecture notes along with two question papers each of 180 min duration, one quiz paper (CIA-I) of 120 min duration on the topics of lectures. The question paper should test concepts, analytical abilities and grasp of the subject. Solutions of questions also should be provided. All these will constitute lecture material.
Section (B): Laboratory experiments reports and professional work report.

Section (C): Research proposal with detailed references and bibliography in a standard format.

Wherever necessary, respective Head of the Departments could be approached by Instructors/panel coordinators for smooth operation of the course. Special lectures dealing with professional ethics in the discipline may also be arranged by the group from time to time.

			Hours			Credits			
MTITDA231	**BIG DATA ANALYTICS**		L	T	P	L	T	P	C
			3	0	0	3	0	0	3

Preamble

To Understand big data for business intelligence

To Learn business case studies for big data analytics

To Understand Nosql big data management

To manage Big data without SQL

To understanding map-reduce analytics using Hadoop and related tools

Prerequisite

NIL

Course Outcomes

CO 1: Describe big data and use cases from selected business domains	Remembering
CO 2: Discuss open source technologies	Understanding
CO 3: Explain NoSQL big data management	Understanding
CO 4: Discuss basics of Hadoop and HDFS	Understanding
CO 5: Discuss map-reduce analytics using Hadoop	Understanding
CO 6: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics	Applying

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3			2		3							
CO4			2		3							
CO5	3	3			3							
CO6	3	3			3							

Syllabus

Unit – I	UNDERSTANDING BIG DATA	9	0	0

What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

Unit – 2	NOSQL DATA MANAGEMENT	9	0	0

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships –graph databases – schema less databases – materialized views – distribution models – sharding –– version – Map reduce –partitioning and combining – composing map-reduce calculations

Unit – 3	BASICS OF HADOOP	9	0	0

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

Unit – 4	MAPREDUCE APPLICATIONS	9	0	0

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution –MapReduce types – input formats – output formats

Unit – 5	HADOOP RELATED TOOLS	9	0	0

Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model –cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation –HiveQL queries-case study.

Text Books

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations",1st Edition, O'Reilley, 2012.

Reference Books

1. VigneshPrajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

Course Designer(s)

Dr. Daniel D

Course Reviewer

Dr Manohar M

MTITDA232	MACHINE LEARNING	Hours			Credits			
		L	T	P	L	T	P	C
		3	-	-	-	-	-	3

Preamble
- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Prerequisite

Linear Algebra, Probability, Statistics and Computer Programming

Course Outcomes

Select real-world applications that needs machine learning based solutions.	Analyze
Implement and apply machine learning algorithms.	Apply
Select appropriate algorithms for solving a particular group of real-world problems.	Analyze
Recognize the characteristics of machine learning techniques that are useful to solve real-world problems.	Remember

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1			1				1
CO2	3	3	3	3	1			1				1
CO3	3	3	3	3	1			1				1
CO4	3	3	3	3	1			1				1

Syllabus

Unit – I	INTRODUCTION	L	T	P
		9	-	-

Introduction- overview of machine learning- Different forms of learning- Generative learning- Gaussian parameter estimation- maximum likelihood estimation- MAP estimation- Bayesian estimation- bias and variance of estimators- missing and noisy features- nonparametric density estimation- applications- software tools.

Unit – 2	CLASSIFICATION METHODS	L	T	P
		9	-	-

Classification Methods-Nearest neighbour- Decision trees- Linear Discriminant Analysis - Logistic regression-Perceptrons- large margin classification- Kernel methods- Support Vector Machines. Classification and Regression Trees.

Unit – 3	GRAPHICAL AND SEQUENTIAL MODELS	L	T	P
		9	-	-

Graphical and sequential models- Bayesian networks- conditional independence-Markov random fields- inference in graphical models- Belief propagation- Markov models- Hidden Markov models- decoding states from observations- learning HMM parameters.

Unit – 4	CLUSTERING METHODS	L	T	P
		9	-	-

Clustering Methods-Partitioned based Clustering - K-means- K-medoids; Hierarchical Clustering - Agglomerative- Divisive- Distance measures; Density based Clustering - DBScan; Spectral clustering.

Unit – 5	NEURAL NETWORKS	L	T	P
		9	-	-

Neural networks- the perceptron algorithm- multilayer perceptron's- back propagation- nonlinear regression- multiclass discrimination- training procedures- localized network structure- dimensionality reduction interpretation.

Text Books

1. K. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. John Mueller and Luca Massaron, "Machine Learning For Dummies", John Wiley & Sons, 2016.

Reference Books

1. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer, 2009.
2. E. Alpaydin, "Machine Learning", MIT Press, 2010.
3. C. Bishop, "Pattern Recognition and Machine Learning, Springer", 2006.
4. ShaiShalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

Course Designer(s)

Dr. Sundara Pandiyan S

Course Reviewer

Dr. Manohar M

MTITDA241E01	ADVANCED DIGITAL IMAGE PROCESSING	L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

The students will learn the fundamental concepts of Image Processing.

The students will learn image enhancement techniques in spatial & frequency domain

The students will learn the restoration & compression models.

Help the students to segmentation and representation techniques for the region of interests.

The students will learn the how to recognize objects using pattern recognition techniques.

Prerequisite

Computer Graphics with Open GL

Course Outcomes

Course Outcome 1: Ability to apply the image fundamentals and mathematical transformations necessary for image processing	L3
Course Outcome 2: Ability to analyze image enhancement techniques in Spatial &frequency domain	L4
Course Outcome 3: Ability to apply restoration models and compression models for image processing	L3
Course Outcome 4: Ability to synthesis image using segmentation and representation techniques	L4
Course Outcome 5: Ability to analyze and extract potential features of interest from the image	L4
Course Outcome 6: Ability to design object recognition systems using pattern recognition techniques	L5

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										
CO2		2	2	2								
CO3		2	2	2								
CO4		2	3	2								
CO5		2	2	2								
CO6		3	2	2	3		2					1

Syllabus

Unit – I	DIGITAL IMAGE FUNDAMENTALS	9	0	3

Image formation, Image transforms – Fourier transforms, Walsh, Hadamard, Discrete cosine, Hotelling transforms

Unit – 2	IMAGE ENHANCEMENT & RESTORATION	9	0	3

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering

Unit – 3	IMAGE COMPRESSION & SEGMENTATION	9	0	3

Compression Models - Elements of information theory - Error free Compression -Image segmentation –Detection of discontinuities – Region based segmentation – Morphology

Unit – 4	REPRESENTATION AND DESCRIPTION	9	0	3

Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors

Unit – 5	OBJECT RECOGNITION ANDINTERPRETATION	9	0	3

Patterns and pattern classes - Decision-Theoretic methods - Structural methods-Case studies

Text Books

1. Gonzalez.R.C& Woods. R.E., "Digital Image Processing", 3rd Edition, Pearson

Education, Indian edition published by Dorling Kindersely India Pvt. Ltd. Copyright © 2009, Third impression 2011.

2. Gonzalez.R.C& Woods. R.E., "Digital Image Processing using MATLAB", 2nd Edition, McGraw Hill Education (India) Pvt Ltd 2011 (Asia)

Reference Books

1. Madan, " An Introduction to MATLAB for Behavioural Researchers", Sage Publications, 2014

Course Designer(s)

Dr Ajit Danti

Course Reviewer

Dr Raju G

MTITDA241E02	DATA VISUALIZATION TECHNIQUES	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

- The students will understand the basic model of the information visualization process, information processing, visual representation, interaction in visual systems and its impacts.
- The students will learn the conceptual framework for visualization design.
- The students will learn how information can be transformed and visualized.
- Helps the students to develop the skills necessary to solve visualization problems and critique and evaluate Information visualization systems.

Prerequisite

Computer Graphics

Course Outcomes

Ability to explain and interpret the basic model of the information visualization and interactive systems.	L2
Ability to investigate and experiment analysis the different Visualization techniques and mapping the data to visual representations	L4
Ability to understand and implement Fisheye visualizations in the information space.	L3
Ability to measure different types of information that can be transformed into visualization.	L5
Ability to solve and organize the visualization problems and to demonstrate visualization based user interface.	L4

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		3	3	3	3							
CO3	3		3		3	2						
CO4	3	3	3	3	3							2
CO5		3		3		2						2

Syllabus

Unit – I	VISUALIZATION	9	0	0

Introduction – Issues – Data Representation – Data Presentation – Interaction.

Unit – 2	FOUNDATIONS FOR DATA VISUALIZATION	9	0	0

Visualization stages – Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing – Types of Data

Unit – 3	COMPUTER VISUALIZATION	9	0	0

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Non Linear Magnification – Comparing Visualization of Information Spaces – Abstraction in computer Graphics – Abstraction in user interfaces.

Unit – 4	MULTIDIMENSIONAL VISUALIZATION	9	0	0

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – Web Works – Data Mapping: Document Visualization – Workspaces

Unit – 5	UNIT V	9	0	0

Case study-Small interactive calendars – Selecting one from many – Web browsing through

a key hole – Communication analysis – Archival analysis
Text Books
1. Colin Ware, "Information Visualization Perception for Design", 3rd edition Margon Kaufmann Publishers, 2012, (Unit II) 2. Robert Spence "Information visualization – An Introduction", 3rd Edition, Pearson Education, 2014. (Unit I &V) 3. Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers 4. Thomas Strothotte, Computer Visualization Graphics Abstraction and Interactivity, Springer Verlag Berlin Heiderberg,
Course Designer(s)
Dr. O.S GNANA PRAKASI
Course Reviewer
Dr. AJIT DANTI

MTITDA241E03	ADVANCED SOFT COMPUTING	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

The course help in understanding the concepts in Soft Computing techniques VIZ Fuzzy systems, Genetic algorithms, Simulated annealing, Ant Colony Optimization and Artificial Neural Networks, to apply these tools in solving problems, to analyze the strengths and weakness of these methods and to choose appropriate Soft Computing technique(s) for a given problem.

Prerequisite

DISCRETE MATHEMATICS

Course Outcomes

Explain concepts in Fuzzy sets, Fuzzy Logic, Genetic Algorithm, Simulated Annealing and Ant Colony Optimization.	L2
Illustrate how Fuzzy Logic, Simulated annealing, Genetic Algorithm and Ant Colony optimization are used to solve problems.	L3
Explain concepts in Artificial Neural Networks (MLP, RBFN, KSOM, ART, BAM, ELM, Deep NN, CNN, RNN).	L2
Illustrate the use of ANN in solving problems.	L3
Select appropriate Soft Computing technique to solve a problem.	L5
Solve Engineering problems using Soft Computing techniques.	L3

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										
CO2	3	3	2									
CO3	3	1										
CO4	3	3	2									
CO5	3	3	2									
CO6	3	3	3		1							

Syllabus

Unit – I	FUZZY SET THEORY	9	0	0

Introduction to Soft Computing. Fuzzy sets and relations- operations – composition. Membership functions – features – Fuzzification - membership value assignments. Defuzzification – Lambda cuts (sets and relations) – Defuzzification to scalars. Fuzzy Logic – approximate reasoning – different forms of implication. Natural language and Linguistic hedges. Fuzzy Rule-based systems – graphical techniques for inference. Extension principle and Fuzzy arithmetic.
Case Studies (minimum two) – application of Fuzzy Logic.

Unit – 2	OPTIMIZATION	9	0	0

Genetic algorithm – Biological background – Search space – Basic terminologies in GA – a simple GA – General GA – Operators in GA (Encoding, Selection, Crossover – mutation) – stopping conditions – Constraints – Problem solving - The schema theorem – advantages – applications.
Case study - Application of GA.
Simulated Annealing: Annealing Schedule, Parameter Selection, Applications.
Case study - Application of SA.
Ant Colony Optimization: Ant Foraging Behavior, artificial ants and minimum cost paths,

ACO Metaheuristic, ACO algorithm for TSP problem, Theoretical considerations, convergence proof, ACO and Model based search. ACO optimization for subset problem,

Unit – 3	NEURAL NETWORKS -I	9	0	0

Supervised Learning Neural Networks – Perceptrons - Adaline – BackpropagationMutilayerPerceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks.
Case study – Application of ANN.

Unit – 4	NEURAL NETWORKS -II	9	0	0

Adaptive Resonance Theory – Introduction – ART 1 – ART2 – Applications.
Basic concepts in Associative memory – BAM.
Extreme Learning Machines - introduction – theory – applications- case study.
Hybrid soft computing systems – ANFIS – concepts and architecture - case study.

Unit – 5	DEEP NETWORKS	9	0	0

Introduction to Deep learning – Deep neural networks – concepts.
Recurrent neural network - concepts – applications.
Convolutional neural network – concepts – case study based on image classification.

Text Books

1. Sivanandam&Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India, 2011
2. T. J. Ross, "Fuzzy Logic with Engineering Applications", 3rd Edition, Wilev, 2014
3. Dorigo Marco, Stützle Thomas, "ANT COLONY OPTIMIZATION", PHI, 2005

Reference Books

1. Rajasekaran and G A V Pai, " Neural Networks, Fuzzy Logic and Genetic Algorithm", 1stEdn, PHI, 2011
2. D. E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", 1stEdn, Pearson, 2016
3. J S R Jang, C T Sun and E Mizutani, " Neuro-Fuzzy and Soft Computing", 1stEdn, Pearson, 2015
4. Charu C. Agrawal, "Neural Networks and Deep Learning", Springer, 2018
5. Frank Millstein, "Convolutional Neural Networks in Python", CreateSpace Independent Publishing Platform, 2018

Course Designer(s)

Dr. RAJU G

Course Reviewer

Dr. Samiksha Shukla

MTITDA241E04	SOCIAL AND WEB MEDIA ANALYTICS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

This course enables the students to Understand social media, web and social media analytics, and their potential impact. Determine how to Leverage social media for better services and Understand usability metrics, web and social media metrics.

Prerequisite

Web Technology/Data Mining / R Programming

Course Outcomes

Use Social Media Analytics and Web analytics	L3
Explain how to leverage social media for better services	L2
Develop KPIs and to build scorecards & dashboards to track Key Performance Indicators (KPIs).	L3
Understand text mining and data mining in social networks.	L2
Use ready-made web analytics tools (Google Analytics) and be able to understand a statistical programming language (R), also use its graphical development environment (Deduce) for data exploration and analysis	L3

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3			2				3			
CO2		3			3						3	
CO3	2	3			3							3
CO4		3									3	
CO5			3		3							3

Syllabus

Unit – I	Introduction to Web & Social Analytics	L-9	T-0	P-0

Overview of web & social media (Web sites, web apps, mobile apps and social media), Impact of social media on business, Social media environment, , How to leverage social media for better services, Usability, user experience, customer experience, customer sentiments, web marketing, conversion rates, ROI, brand reputation, competitive advantages Need of using analytics, Web analytics technical requirements., current analytics platforms, OpenSourcevs licensed platform, choosing right specifications & optimal solution, Web analytics and a Web analytics 2.0 framework (clickstream, multiple outcomes

Unit – 2	Relevant Data And its Collection using statistical Programming language R	9	0	0

Data (Structured data, unstructured data, metadata, Big Data and Linked Data), Participating with people centric approach, Data analysis basics (types of data, metrics and data, descriptive statistics, comparing, Basic overview of R R-Data Types, R-Decision Making, R-Loops, R-functions, R-Strings, Arrays, R-Lists, R-Data Frame, R-CSV Files, R-Pie Charts, R-Bar charts, R-Barplots. Basic Text Mining in R and word cloud.

Unit – 3	KPI/Metrics	9	0	0

Understand the discipline of social analytics, Aligning social objectives with business goals, Identify common social business objectives, developing KPIs; Standard vs Critical metrics. PULSE metrics (Page views, Uptime, Latency, Seven-day active users) on business and technical Issues, HEART metrics (Happiness, Engagement, Adoption, Retention, and Task success) on user behaviour issues; Bounce rate, exit rate, conversion rate, engagement,

Syllabus of VII & VIII Semester B.E. / Computer Science &Engg. strategically aligned KPIs, Measuring Macro & micro conversions, On-site web analytics, off-site web analytics, the goal-signal-metric process. Case study on Ready-made tools for Web and social media analytics (Key Google Analytics metrics, dashboard, social reports, Tableau Public and KNIME

Unit – 4	Mining Twitter and Mining Facebook:	9	0	0

Why Is Twitter All the Rage?Exploring Twitter's API, Fundamental Twitter Terminology, Creating a Twitter API Connection, Exploring Trending Topics, Searching for Tweets, Analyzing the 140 Character, Extracting Tweet Entities, Analyzing Tweets and Tweet Entities with Frequency Analysis, Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms. Analyzing Fan Pages, Examining Friendships, and More Overview, Exploring Facebook's Social Graph API, Understanding the Social Graph API, Understanding the Open Graph Protocol, Analyzing Social Graph Connections, Analyzing Facebook Pages, Examining Friendships.

Unit – 5	Data Mining in Social Media and Social Networks	9	0	0

Introduction, Data Mining in a Nutshell, Social Media, Motivations for Data Mining in Social Media, Data Mining Methods for Social Media, Data Representation, Data Mining - A Process, Social Networking Sites: Illustrative Examples, The Blogosphere: Illustrative Examples, Related Efforts, Ethnography and Netnography, Event Maps.Introduction, Keyword Search, Query Semantics and Answer Ranking, Keyword search over XML and relational data, Keyword search over graph data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks

Text Books

1. Matthew A. Russell, Mining of Social web, O'Reilly; 2 edition (8 October 2013), ISBN-13: 978-1449367619.
2. Charu C Agarwal, Social Network Data Analytics, Springer; 2011 edition (1 October 2014), 978-1489988935

Reference Books

1. Hand, Mannila, and Smyth. Principles of Data Mining. Cambridge, MA: MIT Press, 2001. ISBN: 026208290X.
2. AvinashKaushik, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, John Wiley & Sons; Pap/Cdr edition (27 Oct 2009)
3. Tom Tullis, Bill Albert, Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics, Morgan Kaufmann; 1 edition (28 April 2008).
4. Jim Sterne, Social Media Metrics: How to Measure and Optimize Your Marketing Investment, John Wiley & Sons (16 April 2010) Brian Clifton, Advanced Web Metrics with Google Analytics, John Wiley & Sons; 3rd Edition edition (30 Mar 2012

Course Designer(s)

Dr. Rekha V

Course Reviewer

Dr. Diana Jeba Jingle

MTITDA241E05	MASSIVE GRAPH ANALYSIS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

The course presents the basic concepts in Graph analysis in the big data context. The course is intended to give exposure to basic concepts and practical aspects related to Massive Graph analysis.

Prerequisite

Graph theory, Algorithms, Data Mining concepts

Course Outcomes

Identify applications of massive graph analysis algorithms.	L1
Examine basic concepts in Pregel-like systems	L4
Evaluate Graph Analytic tools	L3
Compare block centric and vertex centric systems	L4
Explain Sub-graph centric and matrix based graph systems	L2

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	2										
CO3	3	2	1	1								
CO4	3	1										
CO5	3	1										

Syllabus

Unit – I	Pregel-Like Systems	9	0	0

Google's Pregel –Computational model, algorithm design; Pregel-like systems – Communication mechanism, Load balancing, out-of-core execution, fault recovery, On-demand querying.
Case study –BigGraph@CUHK

Unit – 2	Shared Memory Abstraction	9	0	0

Programming interfaces and its expressiveness; GraphLab; PowerLab; Single-PC disk-based systems – GraphChi, X-Stream, VENUS, GridGraph.

Unit – 3	Block Centric Computation	9	0	0

Block centric vs Vertex centric; The Blogel Systems; Blogel Graph Practitioners; Block Centric API.

Unit – 4	Sub-graph centric Graph mining	9	0	0

Problem definition and existing methods; The G-thinker systems.

Unit – 5	Matrix based Graph Systems	9	0	0

Graph and Matrices; PEGUSES; GBASE; SystemML; Comparison with vertex based system

Text Books

1. D. Yan, Y. Tian, J.Cheng, "Systems for Big Graph Analysis", Springer, 2017

Reference Books

1. D. Yan, Y. Bu, Y. Tian, A. Deshpande, "Big Graph Analytics Platforms", E-Book (IEEE Explorer), 2017
2. R. Brath, D. Jonker, Graph Analysis and Visualization, Wiley, 2015.

Course Designer(s)

| Dr Raju G. |
| **Course Reviewer** |
| Dr Natarajan K |

MTITDA242E01	INTERNET OF THINGS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

This course introduces the basic concepts of IoT, the functionalities of different types of sensors, actuators and micro controllers. It covers the protocols used in different layers and gives insight on programming IoT for different domains.

Computer Networks
Basics of Programming

Course Outcomes

Explain the fundamental building blocks of an IoT environment from a logical and physical perspective.	Understand
Experiment with Arduino and Raspberry Pi to choose the appropriate hardware for different IoT projects.	Build
Summarize various IoT protocols in Application and Network layers by outlining their advantages and disadvantages.	Analyze
Develop IoT solutions using Arduino and Raspberry Pi to solve real life problems.	Analyze, Apply
Survey successful IoT products and solutions to analyze their architecture and technologies.	Analyze

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2	1	1									
CO3	3	2	2	1								
CO4	2	2			1							
CO5	3	3	3	3	2				1			

Syllabus

Unit – I	INTRODUCTION AND BACKGROUND	9	0	0

Definition and Characteristics of IoT, Physical Design of IoT: Things in IoT, Logical Design of IoT: IoT functional Blocks, IoT Communication Blocks, IoT communication APIs, IoT Enabling Technologies: WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Systems.

Unit – 2	IOT HARDWARE, DEVICES AND PLATFORMS	9	0	0

Basics of Arduino: The Arduino Hardware, The Arduino IDE, Basic Arduino Programming, Basics of Raspberry pi: Introduction to Raspberry Pi, Programming with Raspberry Pi, CDAC IoT devices: Ubimote, Wi-Fi mote, BLE mote, WINGZ gateway, Introduction to IoT Platforms, IoT Sensors and actuators.

Unit – 3	IOT PROTOCOLS	9	0	0

IoT Data Link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Security Protocols, Service Discovery Protocols, Infrastructure Protocols.

Unit – 4	IOT PROGRAMMING	9	0	0

Arduino Programming: Serial Communications, Getting input from sensors, Visual, Physical and Audio Outputs, Remotely Controlling External Devices, Wireless Communication. Programming with Raspberry Pi: Basics of Python Programming, Python packages of IoT, IoT Programming with CDAC IoT devices.

Unit – 5	IOT DESIGN AND CLOUD INCORPORATION	9	0	0

Case Studies- IoT Design and Cloud incorporation: Introduction to IOT Design, Home Automation, Smart Lighting , Home Intrusion Detection, Cities , Smart Parking , Environment , Weather Monitoring System , Weather Reporting Bot , Air Pollution Monitoring , Forest Fire Detection, Agriculture, Smart Irrigation, Productivity Applications , IoT Printer.

Text Books

1. Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands-on-Approach)"**, 1st Edition, VPT, 2014.
2. Margolis, Michael. "Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects. " O'Reilly Media, Inc.", 2011.
3. Monk, Simon. Raspberry Pi cookbook: Software and hardware problems and solutions. " O'Reilly Media, Inc.", 2016.

Reference Books

1. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick – Wiley Publications -2012.
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Al-Fuqaha, Ala, et al. "Internet of things: A survey on enabling technologies, protocols, and applications." IEEE Communications Surveys & Tutorials 17.4 (2015): 2347-2376.
5. Tsitsigkos, Alkiviadis, et al. "A case study of internet of things using wireless sensor networks and smartphones." Proceedings of the Wireless World Research Forum (WWRF) Meeting: Technologies and Visions for a Sustainable Wireless Internet, Athens, Greece. Vol. 2325. 2012.
6. Ye, Mengmei, et al. "Security Analysis of Internet-of-Things: A Case Study of August Smart Lock."

Course Designer(s)

Naveen J

Course Reviewer

Bijeesh T V

			Hours			Credits			
MTITDA242E02		**DEEP AND REINFORCEMENT TECHNIQUES**	**L**	**T**	**P**	**L**	**T**	**P**	**C**
			3	0	0	3	0	0	3

Preamble
- To understand the fundamental principles and techniques in deep and reinforcement learning.
- Helps to understand different algorithms in deep and reinforcement learning.
- Helps to understand few applications of deep and reinforcement learning.
- To analyze few active research topics in deep and reinforcement learning areas.

Prerequisite

Machine Learning, Neural Networks

Course Outcomes

Ability to explain and describe the basics of deep learning and reinforcement techniques	L2
Ability to investigate different regularization and optimization techniques for training deep neural networks.	L6
Ability to implement convolution and recurrent neural networks	L3
Ability to implement and compare various iteration, Monte Carlotemporal-difference reinforcement learning algorithms	L4
Ability to construct and apply on-policy and off-policy reinforcement learning algorithms with function approximation	L6

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		3	3	3	3							
CO3	3		3		3	2						
CO4	3	3	3	3	3							2
CO5		3		3	2							2
CO6												

Syllabus

Unit – I	**Introduction**	8	0	0

Introduction- Historical Trends in Deep Learning, Machine Learning Basics, History of Reinforcement Learning – Examples - Elements of Reinforcement Learning - Limitations and Scope

Unit – 2	**Deep Networks**	9	0	0

Deep Feedforward Networks-Example-Gradient-Based Learning-Hidden Units-Architecture Design- Back-Propagation and Other Differentiation Algorithms, Regularization for Deep Learning, Optimization for Training Deep Models - Challenges - Basic Algorithms - Parameter Initialization - Algorithms with Adaptive Learning Rates - Approximate Second-Order Methods-Optimization Strategies and Meta-Algorithms

Unit – 3	**Convolution Networks**	9	0	0

Convolutional Networks -Operation - Motivation - Pooling - Variants of the Basic Convolution Function -Efficient Convolution Algorithms -Random or Unsupervised Features, Sequence Modeling: Recurrent and Recursive Nets - Unfolding Computational Graphs - Recurrent Neural Networks - Bidirectional RNNs - Encoder-Decoder Sequence-to-SequenceArchitectures -Deep Recurrent Networks -Recursive Neural Networks, Applications

Unit – 4	**Tabular Solution Methods**	10	0	0
Multi-armed Bandits-Dynamic Programming - Monte Carlo Methods -Temporal-Difference Learning -n-step Bootstrapping				
Unit – 5	**Approximate Solution Methods**	9	0	0
On-policy Prediction with Approximation -On-policy Control with Approximation –Off policy Methods with Approximation -Policy Gradient Methods				

Text Books

1. Ian Goodfellow, YoshuaBengio, and Aaron Courville, "Deep Learning" MIT Press, 2016.
2. Richard S. Sutton and Andrew G. Barto,"Reinforcement Learning: An Introduction" second edition, MIT Press.

Reference Books

1. CosmaRohillaShalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.)

Course Designer(s)

Dr. O.S GnanaPrakasi

Course Reviewer

Dr AJIT DANTI

			Hours			Credits			
MTITDA242E03	**PREDICTIVE ANALYTICS**	**L**	**T**	**P**	**L**	**T**	**P**	**C**
		3	0	0	3	0	0	3

Preamble

Analytics is the process of transforming data into insight for making better decisions (INFORMS). There are three primary types of analytics: "Descriptive," which examines historical data and identifies and reports historical patterns and trends; "Predictive," which predicts outcomes and future trends from existing data to help discover new relationships; "Prescriptive," which formulates and evaluates new ways for a business to operate. This course focuses on the second type, Predictive Analytics, which is of particular importance for business because it helps decision makers evaluate possibleoutcomes based on other historical data predictors. The process of analytics involves specifying a question, problem, or decision, and finding the right answers using data. The process begins with identifying the appropriate data sources (internal or external, data format), and the appropriate models, tools, and methods for analysis.

Prerequisites

Probability and Statistics, Artificial Intelligence, R Programming (desired)

Course Outcomes

At end of the course, the students will able to

Demonstrate the fundamental concepts of statistical learning and linear regression with respect to basic predictive analysis process.	L2
Identify the appropriate classification model for the given real time application	L3
Demonstrate the concepts of linear regression models, resampling methods and regularization techniques.	L2
Select the suitable models from Regression, Decision Tree based methodologies for predictive analysis	L3
Identify the suitable models from Support Vector Machines and Unsupervised Learning for the given problem.	L3

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1							
CO2	1	2	2	1	1							
CO3	1	2	2	1	1							
CO4	1	2	2	1	1							
CO5	1	3	2	1	1							

Syllabus

Unit – I	**Statistical Learning & Linear Regression**	**9**	**0**	**0**

Introduction – What is statistical Learning – Assessing Model Accuracy – Linear Regression – Simple Linear Regression – Multiple Linear Regression – Comparison with KNN.

Unit – 2	**Classification**	**9**	**0**	**0**

Overview of Classification – Linear Regression – Linear Discriminant Analysis – Comparison of Classification Models

Unit – 3	**Resampling Methods, Linear Model Selection & Regularization**	**9**	**0**	**0**

Cross Validation – The Bootstrap – Subset Selection – Shrinkage Methods – Dimension Reduction Methods – Consideration in High Dimensions

Unit – 4	**Moving Beyond Linearity & Tree Based Models**	**9**	**0**	**0**

Polynomial Regression – Step Functions – Basis Functions – Regression Splines – Smoothing Splines – Local Regression – Generalized Additive Model – Basics of Decision Trees – Bagging,

Random Forest and Boosting				
Unit – 5	**Support Vector Machines & Unsupervised Learning**	**9**	**0**	**0**

Maximal Margin Classifier – Support Vector Classifiers – Support Vector Machines – SVM with multiple classes – Relationship to Linear Regression – The Challenge of Unsupervised Learning – Principal Component Analysis – Clustering Models

Text Books

1. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2013

Reference Books

1. http://fs2.american.edu/alberto/www/analytics/ISLRLectures.html

Course Designer(s)

Dr. M Balamurugan

Course Reviewer

Dr J Thomas

MTITDA242E04	PATTERN RECOGNITION	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble
Objective of this course is to enable to students to learn the fundamentals of Pattern Recognition techniques, Statistical Pattern recognition techniques, Syntactical Pattern recognition techniques and Neural Pattern recognition techniques useful for computer vision applications.

Prerequisite
Name of Course(s) which is (are) required as prerequisite for this course

Course Outcomes	
Course Outcome 1: Ability to understand the basic concepts of Pattern Recognition and its approaches	L2
Course Outcome 2: Ability to Illustrate various statistical methods for supervised learning classification	L3
Course Outcome 3: Ability to Evaluate the Clustering for Unsupervised learning classification	L5
Course Outcome 4: Ability to apply various syntactic pattern classification methods.	L3
Course Outcome 5: Ability to analyse neural networks and Pattern Recognition methods	L4

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	2	3									
CO3	3	3	2	3								
CO4	2	2	2									
CO5				3	2	2						

Syllabus

Unit – I	PATTERN RECOGNITION OVERVIEW	9	0	0

Pattern recognition, Classification and Description—Patterns and feature Extraction with Examples—Training and Learning in PR systems—Pattern recognition Approaches

Unit – 2	STATISTICAL PATTERN RECOGNITION	9	0	0

Introduction to statistical Pattern Recognition—supervised Learning using Parametric and Non Parametric Approaches

Unit – 3	LINEAR DISCRIMINANT FUNCTIONS &UNSU PERVISED LEARNING AND CLUSTERING	9	0	0

Introduction-Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems—Clustering for unsupervised learning and classification

Unit – 4	SYNTACTIC PATTERN RECOGNITION	9	0	0

Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via

grammatical inference						
Unit – 5	NEURAL RECOGNITION	PATTERN	9	0	0	

Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Case Study - Content Addressable Memory Approaches and Unsupervised Learning in Neural PR

Text Books

1.   Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John Wiley & sons, Inc, 2012(Reprint edition).

Reference Books

1. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India,.Pvt Ltd, New Delhi, 2011.
2. Bishop C.M., "Neural Networks for Pattern Recognition", Oxford University Press, 2005.
3. Duda R.O., P.E.Hart   & D.G Stork, "Pattern Classification", 2nd Edition, J.WileyInc 2001.
4. Duda R.O. & Hart P.E., "Pattern Classification and Scene Analysis", J.WileyInc, 1973.

Course Designer(s)

Dr AJIT DANTI

Course Reviewer

Dr Raju G

MTITDA251	BIG DATA ANALYTICS LAB	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	4	0	0	2	2

Preamble

- To provide a strong foundation of fundamental concepts of Big Data Analytics
- To enable the student to apply data analytics using advanced tools such as Hadoop,cassandra, Hbase and Hive.

Prerequisite

Nil

List of Experiments

Project based Lab : List of the project titles are given below
1. Implementation of aggregate data model uisng No SQL
2. Implementation of file system for performing data analytics uisngHadoop/Cassandra
3. Implementation of data model and clients uingHbase
4. Application development using Hive

Course Designer(s)

Dr. Daniel D

Course Reviewer

Dr.Raju G

MTITDA242E05	OPTIMIZATION TECHNIQUES	Hours			Credits			
		L	**T**	**P**	**L**	**T**	**P**	**C**
		3	0	0	3	0	0	3

Preamble

Introduction to optimization techniques using both linear and non-linear programming. The focus of the course is on convex optimization though some techniques will be covered for non-convex function optimization too. After an adequate introduction to linear algebra and probability theory, students will learn to frame engineering minima maxima problems in the framework of optimization problems.

Prerequisite

Mathematical preliminaries, Linear programming

Course Outcomes

CO	Level
Demonstrate the concepts of fundamental concepts of optimization techniques	L2
Illustrate the concepts of Linear programming	L3
Conduct the experiment on constraint based optimization	L4
Discuss the fundamental concepts of constraint based optimization	L1
Describe the basic concepts of non linear problems	L1

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	2								
CO2	2	1	2	2								
CO3	2		2	2				1				
CO4	2		2	2	1							
CO5	2		2	2								

Syllabus

Unit – I	Mathematical preliminaries	9	-	-

Linear algebra and matrices Vector space, eigen analysis, Elements of probability theory, Elementary multivariable calculus

Unit – 2	Linear Programming	9	-	-

Simplex method, Introduction to linear programming model, Duality, Karmarkar's method

Unit – 3	Unconstrained optimization	9	-	-

Conjugate direction and quasi-Newton methods, Gradient-based methods, One-dimensional search methods

Unit – 4	Constrained Optimization	9	-	-

Lagrange theorem FONC, SONC, and SOSC conditions

Unit – 5	Non-linear problems	9	-	-

Projection methods, KKT conditions, Non-linear constrained optimization models

Text Books

1. Introduction To Optimization 4Th Edition by Edwin K. P. Chong & Stanislaw H. Zak, Wiley India, 2017.

Reference Books

1. Nonlinear Programming, 3rd edition by Dimitri Bertsekas, Athena Scientific, 2016

Course Designer(s)

Dr Manohar M

Course Reviewer

Dr Raju G

MTITDA252	MACHINE LEARNING LAB	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	2	0	0	2	2

Preamble

• To introduce basic machine learning techniques.

• To develop the skills in using recent machine learning software for solving practical problems in high-performance computing environment.

• To develop the skills in applying appropriate supervised, semi-supervised or unsupervised learning algorithms for solving practical problems.

Prerequisite

Statistics, Computer Programming

List of Experiments

1. Exercises to solve the real-world problems using the following machine learning methods:
   • Linear Regression
   • Logistic Regression
   • Multi-Class Classification
   • Neural Networks
   • Support Vector Machines
   • K-Means Clustering & PCA

2. Develop programs to implement Anomaly Detection & Recommendation Systems.
3. Implement GPU computing models to solving some of the problems mentioned in Problem 1.

Course Designer(s)

Dr. Sundara Pandiyan S

Course Reviewer

Dr.Manohar M

MTCS212E01	CONSTITUTION OF INDIA	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

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

Prerequisite
Nil

Unit – I		4	0	0

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

Unit – 2		4	0	0

·Philosophy of the Indian Constitution: Preamble Salient Features, ·Contours of Constitutional Rights & Duties: · Fundamental Rights · Right to Equality · Right to Freedom · Right against Exploitation · Right to Freedom of Religion · Cultural and Educational Rights · Right to Constitutional Remedies · Directive Principles of State Policy · Fundamental Duties.

Unit – 3		4	0	0

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

Unit – 4		4	0	0

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

Unit – 5		4	0	0

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

Text Books
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

Reference Books
D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Designer(s)
Syllabus is taken from AICTE Model curriculum

Course Reviewer

MTCS212E02	PEDAGOGY STUDIES	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble

Students will be able to:
- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Prerequisite

Nil

Unit – I		4	0	0

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

Unit – 2		4	0	0

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

Unit – 3		4	0	0

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

Unit – 4		4	0	0

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

Unit – 5		4	0	0

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

Text Books

Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.

Reference Books

1. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
2. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
3. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
4. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
5. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
6. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Designer(s)
Syllabus is taken from AICTE Model curriculum
Course Reviewer
NA

MTCS212E03	STRESS MANAGEMENT BY YOGA	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble				
● To achieve overall health of body and mind				
● To overcome stress				
Prerequisite				
Nil				
Unit – I		8	0	0
Definitions of Eight parts of yog. (Ashtanga)				
Unit – 2		8	0	0
· Yam and Niyam. Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan				
Unit – 3		8	0	0
·Asan and Pranayam i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types of pranayam				
Text Books				
'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami YogabhyasiMandal, Nagpur				
Reference Books				
"Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata				
Course Designer(s)				
Syllabus is taken from AICTE Model curriculum				
Course Reviewer				

MTCS212E04	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	Hours			Credits			
		L	T	P	L	T	P	C
		2	0	0	2	0	0	2

Preamble

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

Prerequisite

Nil

Unit – I		8	0	0

Neetisatakam-Holistic development of personality · Verses- 19,20,21,22 (wisdom) · Verses- 29,31,32 (pride & heroism) · Verses- 26,28,63,65 (virtue) · Verses- 52,53,59 (dont's) · Verses- 71,73,75,78 (do's)

Unit – 2		8	0	0

Approach to day to day work and duties. ·ShrimadBhagwadGeeta : 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 – 3		8	0	0

Statements of basic knowledge. ·ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68 · Chapter 12 -Verses 13, 14, 15, 16,17, 18 · Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, · Chapter 4-Verses 18, 38,39 · Chapter18 – Verses 37,38,63

Text Books

"Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata

Reference Books

Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, 4. Rashtriya Sanskrit Sansthanam, New Delhi.

Course Designer(s)

Syllabus is taken from AICTE Model curriculum

Course Reviewer

MTCS213	PROFESSIONAL PRACTICE- II	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	2	0	0	2	1

Preamble

SUBJECT DESCRIPTION:

During the seminar session each student is expected to prepare and present a topic on engineering / technology, it is designed to:

- Review and increase their understanding of the specific topics tested.
- Improve their ability to communicate that understanding to the grader.
- Increase the effectiveness with which they use the limited examination time.

SUBJECT OBJECTIVES:

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews and intended to increase the score they earn on the upcoming exam above what they would otherwise earn.

This course is specially designed for the students of higher degree. It aims to train and equip the students towards acquiring competence in teaching, laboratory skills, research methodologies and other professional activities including ethics in the respective academic disciplines.
The course will broadly cover the following aspects:

- Teaching skills
- Laboratory skills and other professional activities
- Research methodology

For teaching suitable courses where strengthening in the training of the students is required will be identified and the student will be asked to prepare lectures on selected topics pertaining to the courses and present these lectures before a panel of faculty members. The student will also be required to prepare question papers which will test the concepts, analytical abilities and grasp in the subject. Wherever the laboratories are involved, students
will also be asked to carry out laboratory experiments and learn about the use and applications of the instruments. The general guiding principle is that the students should be able to teach and participate in the undergraduate degree courses in his/her discipline in an effective manner. The students will also assist the faculty in teaching and research activities.

The course will also contain the component of research methodology, in which a broad topic will be assigned to each student and he/ she is supposed to carry out intensive literature survey, data analysis and prepare a research proposal.

Each group will carry out many professional activities beside teaching and research. Such as, purchase of equipments, hardware, software and planning for new experiments and also laboratories etc. Along with these the students will also be assigned some well defined

activities. The student is expected to acquire knowledge of professional ethics in the discipline.

MTITDA343E01	REAL TIME DATA ANALYTICS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

Inrecentdaysmoreandmoreliveandrealtimedataisgenerated.Henceratherthanstatic offlineanalysisandreporting,theneedforreal-timeanalyticsofdataanddecisionmakingasacquiredsignificantimportance.Suchdataanalytics iscalledreal-time dataanalytics.This course aims at introducing the basics, concepts and delivering real time data analytics.

Prerequisite

Big Data.

Course Outcomes

CO1: Understand the concepts of Streaming Data and issues in stream processing.	L2
CO2: Describe the architecture, defines the various phases and Service Configuration.	L1
CO3: Illustrate the data flow management methods	L3
CO4: Analyze the data processing and flow management	L4
CO5: Evaluate the streaming metrics and delivery	L5

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2	3	2									
CO3		2	2	2	2							
CO4		2	2	2	2							
CO5	2	2	2	2	2	2						

Syllabus

Unit – I	INTRODUCTION TO STREAMCOMPUTING	L : 9	T : 0	P : 0

StreamingData–Sources–DifferencebetweenStreamingDataandStaticData.Overviewof Large Scale StreamProcessing Engines – Issues in StreamProcessing.

Unit – 2	STREAMING ANALYTICS ARCHITECTURE	L : 9	T : 0	P : 0

Phases in Streaming Analytics Architecture - Vital Attributes - High Availability – Low Latency – Horizontal Scalability-Fault Tolerance- ServiceConfigurationandManagement-Apache ZooKeeper.

Unit – 3	DATA FLOW MANAGEMENT	L : 9	T : 0	P : 0

Distributed Data Flows – At Least One Delivery – Apache Kafka – Apache Flume – Zero MQ - Messages, Events, Tasks& File Passing.

Unit – 4	PROCESSING & STORINGSTREAMING DATA	L : 9	T : 0	P : 0

Distributed StreamData Processing: Co-ordination, Partition and Merges, Transactions. Duplication DetectionusingBloomFilters-ApacheSparkStreamingExamplesChoosingastoragesystem– NoSQL Storage Systems.

Unit – 5	DELIVERING STREAMING METRICS	L : 9	T : 0	P : 0

Visualizing Data – Mobile Streaming Apps –Times Counting and Summation - Stochastic Optimization – Delivering Time Series Data.

Text Books

1. Byron Ellis, "Real-Time Analytics: TechniquestoAnalyze and Visualize Streaming Data", Wiley, 1st edition, 2014.

2. SherifSakr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014.	

Reference Books

1. Bill Franks, "Taming The Big Data Tidal Wave Finding Opportunities In Huge Data Streams With Advanced Analytics", Wiley, 2012.
2. Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
3. Paul C Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hil, 1stedition, 2011.

Course Designer(s)

Dr Ganesh Kumar R.

Course Reviewer

Dr Ajit Danti

MTITDA343E02	BIG DATA ANALYTICS FOR IOT	Hours			Credits			
		L	T	P	L	T	P	C
		45	0	0	3	0	0	3

Preamble

To learn the concepts of big data analytics

To learn the concepts about Internet of things

To understand and implement smart systems

Prerequisite

Computer Network

Course Outcomes

Understand the application of Big data in IoT	L1
Explain the RFID false authentications	L2
Describe the concept of fog computation	L2
Illustrate the web enhanced building	L2
Examine the sustainability of data	L4

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1		2							
CO2	2		1		2							
CO3	2		1		2							
CO4	2		1		2							
CO5	2		1		2							

Syllabus

Unit – I	BIG DATA PLATFORMS FOR THE INTERNET OF THINGS	9	0	0

Big Data Platforms for the Internet of Things: network protocol- data dissemination– current state of art- Improving Data andService Interoperability with Structure, Compliance, Conformance andContext Awareness: interoperability problem in the IoT context- Big Data Management Systems for the Exploitation of Pervasive Environments – Big Data challengesand requirements coming from different SmartCity applications

Unit – 2	RFID FALSE AUTHENTICATIONS	9	0	0

On RFID False Authentications: YA TRAP – Necessary and sufficient condition for false authentication prevention - Adaptive Pipelined Neural Network Structure in Self-aware Internet of Things: self-healing systems-Role of adaptive neural network- Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things- Applying spatial relationships, functions, and models

Unit – 3	FOG COMPUTING	9	0	0

Fog Computing: A Platform for Internet of Things and Analytics: a massively distributed number of sources - Big Data Metadata Management in Smart Grids: semantic inconsistencies – role of metadata

Unit – 4	WEB ENHANCED BUILDING	9	0	0

Toward Web Enhanced Building Automation Systems: heterogeneity between existing installations and native IP devices - loosely-coupled Web protocol stack –energy saving in smart building- Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and achievements-Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care – personalized medicine

Unit – 5	SUSTAINABILITY DATA AND ANALYTICS	9	0	0

Sustainability Data and Analytics in Cloud-Based M2M Systems - potential stakeholders and their complex relationships to data and analytics applications - Social Networking Analysis - Building a useful understanding of a social network - Leveraging Social Media and IoT to Bootstrap Smart Environments : lightweight Cyber Physical Social Systems - citizen actuation

Text Books

1. Stackowiak, R., Licht, A., Mantha, V., Nagode, L.," Big Data and The Internet of Things Enterprise Information Architecture for A New Age", Apress, 2015.

Reference Books

Dr. John Bates , "Thingalytics - Smart Big Data Analytics for the Internet of Things", john Bates, 2015

Course Designer(s)

Naveen J

Course Reviewer

Bijeesh T V

MTITDA343E03	NATURAL LANGUAGE PROCESSING	Hours			Credits			
		L	T	P	L	T	P	C
		3	-	-	3	-	-	3

Preamble
To provide a general introduction to natural language processing, fundamentals of parsing words in natural language , advanced feature like structures and realistic parsing methodologies with methods to handle questions with recent trends in typical natural language processing applications

Prerequisite
Formal Languages and Automaton Theory
Compiler Design

Course Outcomes	
Course Outcome 1: Remember the approaches such as Automata Theory, Probability Theory, Predicate Logic and Statistical techniques.	L1
Course Outcome 2: Describe the process of top down parsing and bottom up parsingof string and morphological analysis of lexicons	L2
Course Outcome 3: Apply the techniques for handling questions and analyze the movement phenomenon in language.	L3
Course Outcome 4: Describe shift reduce and deterministic parsers for ambiguity resolution and specifies language models.	L3
Course Outcome 5: Identify the semantic analysis techniques of the natural language with finite state sequence modeling.	L2

Mapping with Program Outcomes (POs)												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	3		2								
CO3	3	3	2	3								
CO4	2	1		1								
CO5		1	1						1	1		

Syllabus				
Unit – I	Introduction to Natural Language Processing	9	0	0
Introduction to Natural Language Processing, Different Levels of language analysis, Representation and understanding, Linguistic background. Language and Grammar-Processing Indian Languages				
Unit – 2	Grammars and Parsing	9	0	0
Grammars and parsing, Top down and Bottom up parsers, Transition Network Grammars, Feature systems and augmented grammars, Morphological analysis and the lexicon, Parsing with features, Augmented Transition Networks.				
Unit – 3	Grammars for Natural Language	9	0	0
Grammars for natural language, Movement phenomenon in language, Handling questions in context free grammars, Hold mechanisms in ATNs, Gap threading,				
Unit – 4	Ambiguity Resolution, Language Models	9	0	0
Human preference in parsing, Shift reduce parsers, Deterministic parsers, Statistical methods for Ambiguity resolution. Language Models: The Milton Model, The Meta Model Recent Trends in NLP, Principle based NLP, Reframing and Chunking Patterns, Research issues in NLP. A Case Study in Natural Language Based Web Search: In Fact System Overview, The GlobalSecurity.org Experience.				
Unit – 5	Recent Trends and Case Studies	9	0	0
Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis				

to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.

Text Books
1. James Allen, "Natural Language Understanding", Second Edition, 2003, Pearson Education. Reprint 2013
2. TanveerSiddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
Reference Books
1. Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python", O'Reilly Media; First edition (July 10, 2009)
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing:
3. Anintroduction to Natural Language Processing, Computational Linguistics and SpeechRecognition", 2nd Edition, Prentice Hall, 2008
Course Designer(s)
Dr Samiksha Shukla
Course Reviewer
Dr Ganesh Kumar

MTITDA343E04	IMAGE AND VIDEO ANALYTICS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

This course is aimed to cover the topics of how image and video analysis is done. The topics include image acquisition, color images, point processing, neighborhood processing, morphology, BLOB analysis, Segmentation in Video data, Tracking, Geometric transformation and visual effects.

Prerequisite

Digital Image processing

Course Outcomes

CO	Level
Understand the techniques of color image processing	L2
Analyse Point and neighborhood processing	L4
Apply morphological techniques on images and videos	L3
Apply segmentation techniques for video data	L3
Design and analyse visual effects in video data	L6

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										
CO2	2	2										
CO3	2	2			2							
CO4					2							
CO5			1									

Syllabus

Unit – I	INTRODUCTION& IMAGE AQUISITION	L	T	P

Different flavors of video and image processing, General Framework, Energy, Optical System, Image Sensor, Digital Image.

Unit – 2	POINT & NEIGBORHOOD PROCESSING	L	T	P

Grey Level & Non Linear Grey level mapping, Image Histogram &Thresholding, Logical operations and Image arithmetic, Median Filters & Correlation.

Unit – 3	MORPHOLOGY & BLOB ANALYSIS	L	T	P

Hit, Fit, Dilation ,erosion, Compound operations, BLOB extractions, Features & Classifications

Unit – 4	SEGMENTATION IN VIDEO DATA, TRACKING& TRANSFORMATIONS	L	T	P

Video Acquisition, Detecting changes in videos, Background substration and Image diffenencing, Tracking by detection & Prediction, Tracking multiple objects, Affine transformations, Backward mapping &Interpolation, Homography.

Unit – 5	VISUAL EFFECTS & APPLICATION EXAMPLES	L	T	P

Visual effects based on pixel manipulation, Visual effects based on geometric transformations, Application examples-Edutainment Game, Coins Sorting using robot.

Text Books

7. Introduction to Video & Image Processing: Building real systemns& Applications, by Thomas B Moeslund, Published by Springer,2012, ISBN-978-1-4471-2502-0, e-ISBN-978-1-4471-2503-7

Reference Books

8. Digital Image Processing Using Matlab by Gonzalez, Rafel C Richards E Woods,

Steven L Eddins, Publisher Pearson,
Course Designer(s)
Dr Ajit Danti
Course Reviewer
Dr Raju G

MTITDA343E05	SCIENTIFIC COMPUTING	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

The course consists of two equal parts: theoretical and practical/computational. The theoretical part of the course introduces the participants to numerical mathematics and prepares them for the scientific computing part. The latter consists of three compulsory projects originating from physics, biophysics and mathematics. Potential topics covered by the course are methods for evaluating integrals, solving systems of differential and algebraic equations, and eigenvalue systems.

Prerequisite

Nil

Course Outcomes

CO	Level
Ability to understand the basics of numerical computing and to solve linear and non-linear equation systems using different methods.	L1
Ability to learn and Apply data interpolation for approximation through its application and learn the differentiate numerical functions using difference approximation.	L3
Ability to understand the basics of statistical computing with probability distribution	L1
Ability to analysis the various variable distribution and sampling process using different algorithms.	L4
Ability to apply the estimation techniques and StatisticalHypotheses on various algorithms	L5

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2									
CO2	2	2	2	2								
CO3	2	2	2				1					
CO4	2	2	2				1					
CO5	2	2	2				1					

Syllabus

Unit – I	Numerical Computing	L:9	T:0	P:0

Introduction, Computer Arithmetic, Errors, Machine Computation. Transcendental and Polynomial Equations: Introduction, Bisection Method, Iterative Methods, Rate of Convergence, Polynomial Equations.Linear Algebraic Equations and Eigenvalue Problems Introduction, Direct Methods, Error analysis, Iteration Methods, Eigenvalues and Eigen Vectors.

Unit – 2	Interpolation and Differentiation	L:9	T:0	P:0

Interpolation and Approximation: Introduction to Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomial using finite differences, Hermite interpolations. Introduction, Numerical differentiation, Numerical integration, Methods based on interpolation. Ordinary Differential Equations: Introduction, Euler methods, Single and Multistep methods, Predictor-corrector methods.

Unit – 3	Statistical Computing	L:9	T:0	P:0

Empirical and Probability Distributions: Basic Concepts, The Mean Variance, and Standard Deviation, Continuous-Type Data, Exploratory Data Analysis, Graphical Comparisons of

Data Sets, Probability Density and Mass Functions. Probability: Properties of Probability, Methods of Enumeration, Conditional Probability, Independent Events, Bayes Theorem

Unit – 4	Variable Distributions and Sampling	L:9	T:0	P:0

Discrete, Continuous& Multivariable Distributions: Random Variables of the Discrete Type, Mathematical Expectation, Bernoulli Trials and the Binomial Distribution, The MomentGenerating Function, The Poisson Distribution, Random Variables of the Continuous Type, The Uniform and Exponential Distributions, The Gamma and Chi-Square Distributions, The Normal Distribution, Distributions of Functions of a Random Variable, Distributions of Two Random Variables. Sampling Distribution Theory: Independent Random Variables, Distributions of Sums of Independent Random Variables, Random Functions Associated with Normal Distributions, The Central Limit Theorem, Approximations for Discrete Distributions, The t and F Distributions

Unit – 5	Estimation & Tests of Statistical Hypotheses	L:9	T:0	P:0

Point Estimation, Confidence Intervals for Means, Confidence Intervals for Difference of Two Means, Sample Size, Tests About Proportions, Tests of the Equality of Two Normal Distributions, Chi-Square Goodness of Fit Tests, Contingency Tables, Tests of the Equality of Several Means.

Text Books

1. Jain,M.K., etal : Numerical Methods for Scientific and Engineering Computation, 6thEdn. New Age Publication, New Delhi, 2012
2. Hogg, R.V. & Tanis E. A. : Probability and Statistical Inference, 6th Edn., Pearson Education, New Delhi , 2004.

Reference Books

1. Sastrty, S.S. – Introductory Methods of Numerical Analysis, 4th Edn., PHI, New Delhi, 2005
2. Hines, W.W. et_al – Probability and Statististics in Engineering, 4th edn., John Witey, Singapore (Indian Reprint), 2003.
3. Veerarajan, T. – Probability, Statististics and Random Processes, 2nd Edn., TMH, New Delhi, 2003

Course Designer(s)

Dr.O.S Gnana Prakasi

Course Reviewer

Dr Rekha

MTITDA343E06	MATRIX COMPUTATIONS	Hours			Credits			
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

Computational analysis of mathematical models is an essential facet of engineering practice and research. Matrix Computation enables effective solution of problems which are not amenable to simple analytical treatment. Eigen values and Eigen vectors are the major concept of these matrix computations. Symmetric Eigen values and asymmetric Eigen values are the primary elements of this matrix computation. A comprehensive introduction to the subject fundamentals provides for the handling of common mathematical problems and prepares a foundation for the learning of advanced tool like TensorFlow.

Prerequisites

Foundation of Mathematics, Numerical Analysis

Course Outcomes

1.	Construct, or give examples of, mathematical expressions that involve vectors, matrices, and linear systems of linear equations.	L3
2.	Evaluate mathematical expressions to compute quantities that deal with linear systems and Eigen value problems.	L5
3.	Analyze mathematical statements and expressions (for example, to assess whether a particular statement is accurate, or to describe solutions of systems in terms of existence and uniqueness)	L4
4.	Rewrite logical progressions of precise mathematical statements to justify and communicate your reasoning.	L6
5.	Apply linear algebra concepts to model, solve, and analyze real-world situations.	L3

Mapping with Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1										
CO2		2										
CO3	3	2		2								
CO4	2	2	3				2				2	
CO5	3	3	2	3	3		2				2	

Syllabus

Unit – I	Gaussian Elimination and Its Variants	9	0	0

Matrix Multiplication, Systems of Linear Equations, Triangular Systems, Positive Definite, Systems; Cholesky Decomposition, Banded Positive Definite Systems, Sparse Positive Definite Systems, Gaussian Elimination and the LU Decomposition, Gaussain Elimination and Pivoting, Sparse Gaussian Elimination, Sensitivity of Linear Systems - Vector and Matrix Norms, Condition Numbers, Perturbing the Coefficient Matrix, A Posteriori Error Analysis Using the Residual, Roundoff Errors; Backward Stability, Propagation of Roundoff Errors, Backward Error Analysis of Gaussian Elimination, Scaling, Componentwise Sensitivity Analysis.

Unit – 2	Least Squares Problem	9	0	0

The Discrete Square Problem, Orthogonal Matrices, Rotators and Reflectors, Solution of the Least Squares Problem, The Gram-Schmidt Process, Geometric Approach, Updating the QR Decomposition.The Singular Value Decomposition – Introduction, Some Basic Applications of Singular Values, The SVD and the Least Squares Problem, Sensitivity of the Least Squares Problem.

Unit – 3	Eigen values and Eigen vectors I	9	0	0

Systems of Differential Equations, Basic Facts, The Power Method and Some Simple

Extensions, Similarity Transforms, Reduction to Hessenberg and Tridiagonal Forms, Francis's Algorithm, Use of Francis's Algorithm to Calculate Eigenvectors, The SVD Revisted, Eigen values and Eigen vectors II - Eigen spaces and Invariant Subspaces, Subspace Iteration and Simultaneous Iteration, Krylov Subspaces and Francis's Algorithm, Large Sparse Eigen value Problems, Implicit Restarts, The Jacobi-Davidson and Related Algorithms.

Unit – 4	Eigen values and Eigen vectors III	9	0	0

Sensitivity of Eigenvalues and Eigenvectors, Methods for the Symmetric Eigenvalue Problem, Product Eigenvalue Problems, The Generalized Eigenvalue Problem

Unit – 5	Iterative Methods for Linear Systems	9	0	0

A Model Problem, The Classical Iterative Methods, Convergence of Iterative Methods, Descent Methods; Steepest Descent, On Stopping Criteria, Preconditioners, The Conjugate-Gradient Method, Derivation of the CG Algorithm, Convergence of the CG Algorithm, Indefinite and Nonsymmetric Problems

Text Books

1. D. S. Watkins, Fundamentals of Matrix Computations, 2nd Ed., John Wiley, 2002.

Reference Books

1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., John Hopkins University Press, 1996.
2. J. W. Demmel, Applied Numerical Linear Algebra, SIAM, 1997

Course Designer(s)

Dr. Jayapandian N

Course Reviewer

Dr. J. Thomas

MITITDA343E07	NoSQL DATABASE	Hours			Credits		
		L	T	P	L	T	P	C
		3	0	0	3	0	0	3

Preamble

NoSQL is an approach to database design that can accomodate a wide variety of data models, including key-value, document, columnar and graph formats. NoSQL, which stand for "not only SQL," is an alternative to traditional relational databases in which data is placed in tables and data schema is carefully designed before the database is built. NoSQL databases are especially useful for working with large sets of distributed data.

Prerequisite

Data Base Management System

Course Outcomes

CO1:Illustrate the characteristics, applications and challenges of NoSQL	Level-1
CO2:Explain the various storage types in database	Level-2
CO3:Examine the various CURD operations	Level-3
CO4: Compare and manage various queries related to MongoDB and CouchDB	Level-4
CO5:Determine the Indexing and ordering operations of Mongo DB and couch DB	Level-3

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2	3	3	3	2	3	3
CO2	3	3	1	3	3	2	2	2	1	2	3	3
CO3	3	3	1	2	3	2	3	3	1	2	3	3
CO4	3	3	2	3	3	1	2	2	2	2	3	3
CO5	3	3	3	1	1	3	3	3	3	2	3	3

Syllabus

Unit – I	UNIT 1 – An Overview and Characteristics of NoSQL	9	0	0

Introduction to NoSQL : An Overview of NoSQL- Defining NoSQL- History- List of NoSQL Databases. Characteristics of NoSQL- Application- RDBMS approach- Challenges- NoSQL approach.

Unit – 2	UNIT 2 – NoSQL Storage Types	9	0	0

Modifying and managing NOSQL, Data store,-Indexing and ordering datasets (MongoDB/ CouchDB
/ Cassandra) - NoSQL Storage Types -Storage types-Column-oriented databases, Document store- keyvalue
store- graph store,-multi-storage type databases,-comparing the models

Unit – 3	UNIT 3 – Advantages and Drawbacks	9	0	0

Advantages and Drawbacks -Transactional application- Computational application- Web-scaleApplication.
Performing CURD operations- Creating records-accessing data- updating and deletingdata.

Unit – 4	UNIT 4 - Querying SQL	9	0	0

Querying NoSQL stores - Similarities between NoSQL and MongoDB query features. Managing datastores and managing evolutions.

Unit – 5	UNIT 5 – Indexing and Ordering	9	0	0

Indexing and ordering data sets- Essential concepts behind database index, indexing and ordering in MongoDB- indexing and ordering in CouchDB, Comparative Study of NoSQL Products:Technical comparison- Implementation language- Engine types- Speed-Features-Limits- Bulk Operations- Bulk read- Bulk insert- Bulk update-Bulk delete- Query options.

Text Books
1. Pramod.J.Sadalage and Martin Fowler, "NoSQL Distilled : A Brief guide to the emerging world of polygot persistence", Pearson Education corporation, I Edition, 2014
2. ShanshankTiwari "Professional NOSQL", WROX Press, 2011.

Reference Books
1. The definitive guide to MONGODB, The NOSQL Database for cloud and desktop computing,Apress 2010.
2. https://www.mongodb.com/nosql-explained.
3. http://www.dbta.com/Editorial/Trends-and-Applications/NoSQL-for-the-Enterprise- 80198.aspx
4. http://www.oracle.com/technetwork/database/databasetechnologies/nosqldb/overview/index.html.

Course Designer(s)
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Course Reviewer
Dr Natarajan. K

MTCS381	INTERNSHIP	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	4	0	0	2	2

Preamble

INTERNSHIP POLICY, GUIDELINES AND PROCEDURES

INTRODUCTION

Internships are short-term work experiences that will allow a student to observe and participate in professional work environments and explore how his interests relate to possible careers. They are important learning opportunities trough industry exposure and practices. More specifically, doing internships is beneficial because they provide the opportunity to:

- Get an inside view of an industry and organization/company
- Gain valuable skills and knowledge
- Make professional connections and enhance student's network
- Get experience in a field to allow the student to make a career transition

Regulations

1. The student shall undergo an Internship for30 days starting from the end of 2nd semester examination and completing it during the initial period of 3rd semester.

2. The department shall nominate a faculty as a mentor for a group of students to prepare and monitor the progress of the students

3. The students shall report the progress of the internship to the mentor/guide at regular intervals and may seek his/her advise.

4. The Internship shall be completed by the end of 7th semesters.

5. The students are permitted to carry out the internship outside India with the following conditions, the entire expenses are to be borne by the student and the University will not give any financial assistance.

6. Students can also undergo internships arranged by the department during vacation.

7. After completion of Internship, students shall submit a report to the department with the approval of both internal and external guides/mentors.

8. There will be an assessment for the internship for 2 credits, in the form of report assessment by the guide/mentor and a presentation on the internship given to department constituted panel

MTCS382	DISSERTATION PHASE -I	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	20	0	0	20	10

Preamble

- ❖ Assessment of Project Work(Phase I)

  - ▪ Continuous Internal Assessment:100 Marks
    - ♦ Presentation assessed by Panel Members
    - ♦ Guide
    - ♦ Mid semester Project Report

MTCS483	DISSERTATION PHASE -II	Hours			Credits			
		L	T	P	L	T	P	C
		0	0	32	0	0	32	16

Preamble

❖ Assessment of Project Work(Phase II) and Dissertation

  ▪ Continuous Internal Assessment:100 Marks
    ♦ Presentation assessed by Panel Members
    ♦ Assessed by Guide
    ♦ Mid Semester Project Report
  ▪ End Semester Examination:100 Marks
    ♦ Viva Voce
    ♦ Demonstration
    ♦ Project Report
  ▪ Dissertation (Exclusive assessment of Project Report): 100 Marks
    ♦ Internal Review : 50 Marks
    ♦ External review : 50 Marks