CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

STUDENT'S

HANDBOOK

Faculty of Technology andEngineering
First Year B. Tech Programme (CE/CSE/IT/EC)
Chandubhai S. Patel Institute of Technology
Devang Patel Institute of Advance Technology and Research

PAE

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PART A

GENERAL INFORMATION

1 CHARUSAT Legends &Terminology

CHARUSAT legends are the abbreviation and acronym of the terms used at the university. CHARUSAT legends also include some important terms used at the academic life of the University. The legends are being used to simplify and facilitate rapid communication.

Legends

CHARUSAT	CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CSPIT	Chandubhai S Patel Institute of Technology
DEPSTAR	Devang Patel Institute of Advance Technology and Research
RPCP	Ramanbhai Patel College of Pharmacy
PDPIAS	P D Patel Institute of Applied Sciences
CMPICA	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications
I2IM	Indukaka Ipcowala Institute of Management
ARIP	Ashok & Rita Patel Institute of Physiotherapy
MTIN	Manikaka Topawala Institute of Nursing
CIPS	Charotar Institute of Paramedical Science
CSMCRI	Central Salt and Marine Chemicals Research Institute
CHRF	Charusat Healthcare & Research Foundation
CSRTC	Charusat Space Research and Technology Centre
HRDC	Pri. B. I. Patel Human Resource Development Centre
KRADLE	Dr. K C Patel Research & Development Centre
CREDP	Charusat Rural Education Development Program
UIIC	University Industry Interaction Cell
CDPC	Career Development and Placement Cell
EDIC	Entrepreneurship Development & Incubation Cell
EOC	Equal Opportunity Cell
IQAC	Internal Quality Assurance Cell
CPSH	Cell for Prevention of Sexual Harassment
ARC	Anti-Ragging Committee
ISC	International Student Cell
GRC	Grievance Redressal Cell
WDC	Women Development Cell
WINCELL	Wireless Information and Networking Cell
CAA	Charusat Alumni Association
ICC	International Center for Cosmology

Terminology

Definitions of Key Words:

1) **Academic Year:** Bachelor of Technology (B.Tech) is the 4-year Course shall be divided into 8 independent semesters with two semesters (One Odd + One Even) in one academic year.
2) **Semester:** Shall constitute of 26 weeks. Each semester shall have minimum 90 days of direct class room teaching, tutorials, counseling, project work and self-learning.
3) **Programme:** An educational programme leading to award of a Degree, Diploma or Certificate.
4) **Course:** Course is a subject in a given semester of a particular programme with given credits and teaching plan leading to an examination.
5) **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
6) **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
7) **Credit:** means a unit by which the coursework is measured. As a general guideline, one credit means one hour of class room teaching or minimum one and half to two hours of practical work per week.
8) **Grade Point:** It is a numerical weight allotted to each letter grade on a 10-point scale.
9) **Credit Point:** It is the product of grade point and number of credits for a course.
10) **Letter Grade:** Is a parameter to indicate the performance of a student in a particular course.
11) **Percentage:** The result obtained by multiplying a quantity by a percent. Or proportion or rate per hundred parts. The percent value is computed by multiplying the numeric value of the ratio by 100.
12) **Semester Grade Point Average (SGPA):** It refers to the performance of a student in a given semester. SGPA is ratio of the 'sum of all the products of credit points and grade point earned by the student in all courses of the semester' and the 'total number of credits of all subjects offered in that semester'.
13) **Cumulative Grade Point Average (CGPA):** It refers to the performance of the student in all completed semesters and is equal to Cumulative Grade Point Weighted Average.
14) **Transcript:** A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him / her, grades obtained and the final CGPA.

2 Student's Core Commitments

CHARUSAT is committed to nurture academic, personal and social values in the students; and expects the students to practice the following Core Commitments of academic, personal and social Responsibility.

ACHIEVING EXCELLENCE

Developing a strong work ethic and consciously doing one's excellent in all aspects of the university.

CULTIVATING, PERSONAL & ACADEMIC INTEGRITY

Recognizing and acting on a sense of respect and dignity both by being honest in relationships and by upholding academic integrity.

CONTRIBUTING TO A LARGER COMMUNITY

Recognizing and acting on one's responsibility to the educational community, the local community, and the wider national and global society.

TAKING SERIOUSLY THE VIEWPOINT OF OTHERS

Recognizing and acting on the responsibility to inform one's own judgment; and engaging various and competing viewpoint as a resource for learning, citizenship, and work.

ENLIGHTENING, ETHICAL AND MORAL REASONING

Developing moral reasoning in ways that incorporate the other four responsibilities and using such reasoning in learning and in life.

3 Academic Life

CHARUSAT wants all students to achieve their highest academic potential and makes faculty and academic support resources available to assist each student in meeting his/her academic goals.

☞ Teacher

Students needing assistance with a specific course should first seek the help of the teacher. Maintaining continued contact with a teacher and staying informed of academic status in a course is recommended.

☞ Counselor

Each student has a counselor who is knowledgeable about the course the student is pursuing and available to help the student to any academic issue. In addition, the counselor is available to counsel students on all matters related to being a university student as well as on life issues.

☞ Libraries, Laboratories and Workshops

The university has established libraries, laboratories and workshops for an interactive and engaging learning experience.

☞ Attendance Policy

Every institute of CHARUSAT has its own attendance policy; students are required to fulfill the criteria of attendance. Students are required to understand and follow the attendance policy of their institute.

☞ Training and Placement Services

Training and Placement Services at CHARUSAT offers counseling on the choice of a course based on a student's abilities and career interests, as well as networking opportunities with recruiters for potential employment.

4 Academic Integrity

CHARUSAT strongly recommends honesty and integrity in all academic work.

Academic Integrity is an ethical practice that means students are achieving academic success fairly. It suggests that all results that are achieved are earned honestly.

Your education is an investment; not maintaining academic integrity may devalue your education, which affects the worth of your degree. Academic Integrity is essential for any society, as people citizens need to trust that who are in positions of authority have earned their credentials rightfully.

Students are expected to exhibit integrity by being truthful about their own academic work and properly acknowledging sources of ideas and information.

- **Cheating in any form is not tolerated**

Cheating Includes:

- Assignment, such as requesting or accepting answers on a quiz or test from another student who has already taken it,
- Discussing test information to any extent with other students, transmitting quizzes or tests or answers to quizzes or tests electronically to other students via cellphone, email, etc.
- Including turning in someone's work as one's own (another student's, a purchased paper from an online source, etc.)

- **Plagiarism is another form of cheating and academic dishonesty. Intentional or unintentional plagiarism is an offense**

Plagiarism includes:

- Use to any degree of the ideas or words of one's source material without proper acknowledgement. Plagiarism typically takes two forms:
- Failure to acknowledge the use of an author's ideas or organization by footnote or identification of the source in the text of the paper.
- Incomplete paraphrase (mere rearrangement of syntax and substitution of synonyms for the author's words) is plagiarism.
- Failure to acknowledge the use of an author's words by quotation marks, as well as by footnote or identification in the text.
- You may consult your teacher or counselor to know more on how to avoid cheating, plagiarism and maintain academic integrity.

5 Social Life

CHARUSAT's overarching goal is to teach students how to live. To help students experience long-term social success.

CHARUSAT provides ample opportunities to students to enhance their social life on campus. There are many activities, clubs and events organized to enhance student's social interactions and skills.

➢ CHARUSAT PROMOTES

- ❖ **Healthy Friendship**
- ❖ **Group Activities**
- ❖ **Enhancement of Fraternity**
- ❖ **Respect for Others**
- ❖ **Dignity in Behavior**
- ❖ **Upholding Social and Moral Values**
- ❖ **Outreach Activities in the Society**
- ❖ **Development of Network**

6 Code of Conduct

Statement of Expectations

As members of the university's community, all students, groups of students, and student organizations are expected to exemplify CHARUSAT's community principles and values, to engage in socially responsible behavior, and to model exceptional conduct, character, and citizenship on campus and beyond.

Parent or Family Contact

Contact with a student's parents or legal guardians may occur or be required in certain circumstances in connection with a matter involving alleged student misconduct or any other academic or personal matter.

Hostel Life

Students are required to follow the rules of the respective residential facility. A decent decorum should be maintained while living in the hostels or any other residential facilities.

Wi-Fi & Internet

CHARUSAT campus is Wi-Fi enabled; moreover, all computers are equipped with internet facility. Students are required to use this facility with maximum integrity. Any misuse of it or misconduct through it will lead to punishment or penalty.

Infrastructure and Instruments

CHARUSAT campus is beautifully designed. All classrooms, laboratories and other areas of the campus are equipped with various amenities and academic instruments. Students are required to use amenities and academic instruments with maximum integrity. Any misuse of it or misconduct through it will lead to punishment or penalty.

Social Media

Social Medias such as Facebook, Twitter, What's App etc. are part of our daily life but it is recommended that all students maintain dignity in the content of posting/ commenting about others and the university.

Communication Devices

Use of cell-phones and other communication devices in the classroom, laboratories, libraries, and at other academic area are prohibited.

Dressing

Students are required to maintain dignified appearance. You may dress up with formal or semi• Formal cloths and accessories.

Prayer

CHARUSAT respects all religion. There is a tradition of prayer recitation at the campus premises through Public Address System at 8:55 am. All are requested to maintain the dignity of the prayer time.

7 Do'S & Don'ts

Do's

- ❒ Set your academic goal high.
- ❒ Attend classes regularly.
- ❒ Participate in all activities & events.
- ❒ Take class notes regularly and refer to them when required.
- ❒ Speak to your teachers and counselor about your any academic or personal issues.
- ❒ Speak to administration for any issues or problems related to student services.
- ❒ Participate in, or create a study group.
- ❒ Keep the campus clean.
- ❒ Socialize with your peers and develop strong professional relationships.
- ❒ Maintain regular contact with your parents to report both good news and bad news.
- ❒ Maintain codes of conducts in any kind of communication - oral or written.
- ❒ Complete your assignments, projects or any other academic work on time.
- ❒ Inspect properly the place before renting resident outside the campus.
- ❒ Ask what you can do to help others.
- ❒ Consult CHARUSAT website and notice boards regularly for any updates and announcements.

Don'ts

- ☒ Wander around the unknown peripheral areas of the campus.
- ☒ Share personal information to unknown.
- ☒ Damage any property of the campus.
- ☒ Leave your personal belongings unattended.
- ☒ Participate in or initiate gossips or rumors.
- ☒ Make loud noise or create confusion in the class room, auditorium or elsewhere in the building.
- ☒ Use abusive language.
- ☒ Assume your first and second semester marks don't count. CGPA's of your whole program are looked at during applications for further studies and career.
- ☒ Use cell-phones or any other communication devices in the classroom or any other part of the building where academic activities are going on.

8 Student Services

CHARUSAT strongly believes that a student's life at the campus should be comfortable and hassle-free, and for that the university has carefully designed various services for the students. You are requested to avail the services as and when required.

Library

- The Knowledge Resource center (Central Library) - a proud partner in the institute's march towards its vision, plays a vital role in acquisition, organization and dissemination of knowledge. You shall need this for almost all your academic assignments!
- It has an excellent collection of both print and electronic books, journals, technical reports, back volumes and other reading material. It has adequate infrastructure to meet its requirements, has computerized all its operation using software developed in-house, and provide access to the collection through Online Public Access Catalogue (OPAC).
- Along with the Central Library, there are Institute Level Libraries in each Institute Building. The Libraries are enriched with more than 50,000 books and 15,000 journals (including e-journals).
- The Knowledge Resource Centre maintains a e-resource access center containing 25 computer terminals for the students in which they can access national and international e resources namely IEEE, ASME, AIP, IOP, IPS, CSPIT library database containing CD's, e-books, journals, Project Reports, Syllabus, University Exam papers through Intranet (ftp://172.16.1.14). Moreover separate computer terminals provide to students with CD writer and USB port for their presentation of seminar, project work and day to day work. The E-resources can be accessed through other computer terminals anywhere in campus. Try learning more on this!!

For any queries, you may please contact the Library office

Contact Person: Mr. Dinesh Patel, Librarian
Contact Number: (02697) 265032; 9909543820
Contact Email: dineshpatel.lib@charusat.ac.in

Residences

- The residences for girls are available at CHARUSAT Campus and residences for boys are available adjacent to campus.
- The life in hostels enables students to spend ample time at the university utilizing library and other facilities to ensure they develop academically and acquire the necessary skills that can be obtained only through experience.

For any queries, you may please contact
Contact Person: Mr. Hasmukh Patel
Contact Number: (02697) 265004; 9426500630
Contact Email: hasmukhpatel.adm@charusat.ac.in

Transport Services

- CHARUSAT has outsourced bus services for providing the transportation facilities to the students.
- A fleet of buses are there for transporting students and staff from different locations in Ahmedabad, Vadodara, Anand and Nadiad and nearby villages every day. A VITCOS bus service has been initiated for students from Anand at a very minimal rate.
- Students are supposed to pay directly to the travel company either monthly or six-monthly or yearly installments.

For any queries, you may please contact
Contact Person: Mr. Milan Rabari
Contact Number: (02697) 265018;

Healthcare

- CHARUSAT Hospital is established to provide primary health care services for emergency and daily health cases. It organizes periodical health screening programs and health awareness activities and campaigns.

For any queries and emergencies, you may please contact
CHARUSAT Hospital, Reception Desk
Contact Number: (02697) 265291; 9537927873

ⓘ Student Safety Cellsⓘ

☞ CHARUSAT believes that it should be a safe workplace as well as a safe place to study. All the students of CHARUSAT may avail following help if need arises:

Cell for Prevention of Sexual Harassment (CPSH)
Please call on 7600414303 for complaints
https://www.charusat.ac.in/ac/cells-at-charusat/

Anti-Ragging Committee (ARC)
Please call on 09925830781 for complaints.
https://www.charusat.ac.in/ac/cells-at-charusat/

Wincell

☞ The Wireless Information and Networking Cell, is the Cell looking after IT Infrastructure of CHARUSAT. CHARUSAT is a Wi-Fi zone with 100 mbps connectivity. Internet is available on each computer terminals. For all your queries like Internet Access, Printing or other such issues, contact Wincell Department.

For Wincell Department, you may please contact
Contact Person: Mr. Ritesh Bhatt
Contact Number: (02697) 265106; 9924444809
Contact Email: riteshbhatt.win@charusat.ac.in

E-Governance

☞ Almost all the process of CHARUSAT are computerized and connected through customized Entrepreneurs Resource Planning Software. This whole system is called E-Governance. The students shall be needing to access this system for registration, syllabus, time-table, attendance, student I-card, Fees and other receipts, exam results, convocation form, interaction platforms with teachers like blogs, etc.

☞ Each department has an E-Governance Representative. You may contact Principal of your Institute forfurther details.

Study Foyer

☞ There is a special area dedicated for reading. It is located on the first floor near central library.

Reprography & Stationery

☞ There are facilities for reprography (photocopy) and buying stationeries on campus. It is located on the first floor near central library.

Bank, Post & ATM

☞ There are facilities of banking and post in campus. It is located in the central administrative building, and ATM facility is just near to campus.

9 Career Development & Placement Cell

The Motive of Charotar University of Science and Technology (CHARUSAT), Changa is to help society to develop towards a better future. We believe in providing value based education to the students so that they can be better employable candidates and more importantly an individual contributing to the organization and the society as a whole.

For the same purpose, a dedicated centralized Career Development and Placement Cell has been constituted on the campus. The Cell coordinates all the Training and Placement activities of different institutes of the University and enhances Industry Institute Interaction

Training Activities

☞ Training activities are arranged at two levels i.e. CDPC and institute or department wise. The training programmes are concentrated towards providing students with ample exposure to recruitment patterns and skill requirements of different private and public sector organizations. The training programs offered include Behavioral Skills, Technical Skills, Personality Improvement, and Communication Skills.

☞ Each Institute provides Training in accordance with the curriculum/course. Training is provided to them in coordination with different Private/Public organization according to prevalent Industry demand. This is undertaken to provide the student with the real time environment in industry so that the student can have a firsthand practical experience of the latest practices and technologies. The duration of the training can differ according to specific course and its need. The Training Cell also arranges program on Behavioral Skills and Technical Skills Training to the students prior to facing Campus Placements.

Placement Activities

☞ The Robust and Dedicated Centralized Placement Cell facilitates On-Campus / Pooled Campus / Off-Campus activities to provide job assistance to students in leading organization. The Placement Department in coordination with Institute Placement Coordinator invites reputed organization for placements activities. All the Major Industry and Sector are targeted to make provide ample opportunities to the students.

Career Guidance

☞ Career Guidance Career Development and Placement Cell also organizes Seminars/Workshops/Training Programs/Guest Lectures on various career avenues and options that a student could explore (GATE/GRE/TOEFL/CAT/UPSC/GPSC etc). Sectoral Inputs are provided to students to make wise choices about the sector they choose to build their career.


🏛 Resume Building and Interview Preparation🏛

☞ The cell guides students on how to prepare appropriate Resume/CV including video resume and how to prepare for the interviews. Special sessions on technical / aptitude / soft and employability skills are conducted in house as we well as by inviting Industry experts to provide students more exposure and improve their employability.



🚹 Placement Infrastructure 🚹

☞ The University has state of the art infrastructure with 24X7 Wi-Fi Campus, Internet Connectivity, Several Large network line Labs and Auditoriums and Seminar halls for conducting Placement Drives. CHARUSAT has also hosted Pooled Campus Drives for Infosys, Amdocs, and Alembic to name a few, for the entire region.

For further information, you may please contact
Training & Placement Officer

Contact: Mr. Divyang Purohit

Prof. Ashwin Makawana, Mr. Ernest Stevens

Contact Number: (02697) 265213; 9913686259

Email: tnp@charusat.ac.in, divyangpurohit.tnp@charusat.ac.in

There are also T&P co-coordinators in each Department; you may contact HOD of your department to know more.

10 Student Professional Activities

✡ Student Chapters, Societies and Academies ✡

IEEE	IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. CHARUSAT is an official Student Branch of IEEE. Tech Enthusiastic Student IEEE Members of CHARUSAT organizes technical activities like workshops, seminars and Technical Festivals to motivate and increase other student's interest in technical research and innovations. IEEE Student Branches are established at universities and colleges around the world. Within IEEE, activities are organized geographically by Region and local Section. Student Branches in R10 with Counsellor & Chair contact August 2015, CHARUSAT University is one of the active Student branch in Asia and Pacific Region.
COMPUTER SOCIETY OF INDIA ESTD. 1965	Computer Society of India is the first and largest body of computer professionals in India. It was started on 6 March 2065 by a few computer professionals and has now grown to be the national body representing computer professionals. It has 72 chapters across India, 511 student branches, and 100,000 members. The Computer Society of India is a non-profit professional meet to exchange views and information learn and share ideas. The wide spectrum of members is committed to the advancement of theory and practice of Computer Engineering and Technology Systems, Science and Engineering, Information Processing and related Arts and Sciences.
NPTEL	NPTEL has been offering online certification for its courses, the highlight being the certification exam through which the student gets an opportunity to earn a certificate form the IITs! To take this initiative forward and to encourage more students across colleges to participate in this initiative, CHARUSAT had started NPTEL Local chapter during December 2015 which is currently coordinated by CSPIT, the sister institute of DEPSTAR under CHARUSAT University.
acm Association for Computing Machinery	The Association for Computing Machinery is an international learned society for computing, founded in 2047. ACM is the world's largest educational and scientific computing society, delivers resources that advance computing as a science and a profession. ACM is solely dedicated to computing. ACM provides the computing field's premier digital library and serves its members and the computing profession with leading-edge publications, conferences and career resources. CHARUSAT is an official Student Chapter of ACM initiated by Department of Information Technology, CSPIT on 26th August 2016.
Microsoft IT Academy	Microsoft Technology Associate (MTA) Microsoft Certified Solutions Associate (MCSA) Microsoft Certified Solutions Expert (MCSE) Microsoft Certified Solutions Developer (MCSD)
ORACLE ACADEMY	Oracle Certified Associate (OCA) Oracle Certified Professional (OCP) Oracle Certified Master (OCM) Oracle Certified Expert (OCE) Oracle Certified Specialist (OCS) Oracle Certified Associate Java SE Programmer. Oracle Certified Professional Java SE Programmer.
CISCO Networking Academy	Cisco Certified Network Associate 1 (CCNA 1) Cisco Certified Network Associate 2 (CCNA 2) Cisco Certified Network Associate 3 (CCNA 3) Cisco Certified Network Associate 4 (CCNA 4) Cisco Certified Network Professional (CCNP)
aws	Amazon Web Services

Cyberoam CCNSP	CCNSP: Cyberoam Certified Network & Security Professional
redhat	Red Hat System Administration I (RH124) Red Hat System Administration II (RH134/RH135) Red Hat Certified System Administrator (RHCSA) Red Hat System Administration III (RH254/RH255) Red Hat Certified Engineer (RHCE)
THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS · INDIA · IETE	The chapter is established in the year 2007 to provide a platform to students to help in applying their technical skills to practical aspects. This chapter has conducted various expert lectures, Two National level TECHFEST in the year 2008 and 2010 and more than 15 various workshops to practical exposure. Some of the Chapter activities are: Technical Quizzes, Circuit Designing Circuit analysis and fault finding, Elocution, Seminars and workshops, Poster presentations, Concept and idea presentation and exhibitions, Technical treasure hunts, Expert lectures
INDIAN SOCIETY OF HEATING REFRIGERATING & AIR CONDITIONING ENGINEERS	The ISHRAE student chapter in CHARUSAT have been established to promote the activities to protect the Environment, improve Indoor Air Quality, help Energy Conservation, and provide continuing education to the Members and others in the HVAC & related user Industries and offer certification programs, career guidance to students. Some of the Chapter activities are: Industrial visit, Guest Lecture, Quiz, Seminars etc.
SAEINDIA Society of Automotive Engineers INDIA	SAEINDIA is an affiliate society of SAE International, registered as an Indian non-profit engineering and scientific society dedicated to the advancement of mobility community in India. As an individual member driven society of mobility practitioners, SAEINDIA comprises members who are individuals from the mobility community, which includes engineers, executives from industry, government officials, academics and students. Principal emphasis is placed on transport industries such as automotive, aerospace, and commercial vehicles. SAEINDIA sections were formed all across the country.
SCE SOCIETY OF CIVIL ENGINEERING	Society of Civil Engineering (SCE) is a non-registered non-profit academic initiative taken by the Department of Civil Engineering, Chandubhai S. Patel Institute of Technology under the governance of Charotar University of Science and Technology. The SCE is a society with a group of nascent engineers committed to experience high applications of civil engineering concepts on field with an objective of promoting civil engineering, bring new technologies in civil engineering to the grass root level of the human society through students and promote environmentally sustainable construction technologies.
FESTO Centre of Excellence 	FESTO Didactic has been recognized worldwide for the development of high-quality, intuitive learning systems for technical education. FESTO Didactic brings over 40 years of experience into developing solutions for fast learning and successful retention over a broad spectrum of technologies. FESTO Centre of Excellence at CHARUSAT has learning and training facilities for pneumatic systems, hydraulic systems and factory automation. It is an experience center in true sense.
International Center for Cosmology ICC	The International Center for Cosmology has been initiated with the purpose of conducting frontier level research on the nature and structure of our universe. There have been path-breaking developments on our knowledge of cosmos in the past decades, and exciting new horizons are emerging. The International Center for Cosmology which was inaugurated in 2018, plans to contribute in a big way in these exciting developments, thus fostering a vibrant research culture within a University environment.

11 Student Activities & Events

NSS & NCC

☞ CHARUSAT offers training for NSS and NCC for interested students. Interested students may please contact the Sports and Gymnasium Coordinator

For any queries or details, you may please contact

Contact Person: Mr. Yogesh Jani

Contact Number: (02697) 265036; 9558295583

Contact Email: yogeshjani.sports@charusat.ac.in

Co-Curricular & Cultural Events

☞ A vast range of cultural and social activities are available to CHARUSAT students, faculty and staff. Getting involved in campus life is the quickest way to become a part of the University community, and to create one's own CHARUSAT experience. Campus life activities are built around the concepts of encouraging each community member to express his or her talents and to respect all members of our pluralistic community.

☞ The students can exhibit their special talents by the multiple college and inter-college competitions within and outside the campus. CHARUSAT organizes a four day gala event of University level Cultural Competition named SPOURAL. In addition, CSPIT organizes COGNIZANCE - TECH FEST, a state level technical event annually.

☞ The University also encourages the students and staff to celebrate all the varied festivals at the campus like Uttrayan, Holi, Navratri, Ganesh Chaturthi, etc.

12 Recreation & refreshments

🏋 Sports & Gymnasium 🏋

☞ CHARUSAT campus offers wide range of team sports, exercises, fitness and other related activities. Selected activities include various indoor and outdoor games like badminton, table tennis, cricket, volleyball and football, gymnasium, etc.

☞ The gym is open from 9am to 5pm. Please remember to bring your student ID card every time you visit the gym and you also have to bring sport shoes. Non-sport shoes will not be allowed in the gym.

Sr. No.	Activities	Timing
1.	University Fitness Center GroundFloor,ARIPBuilding	Morning 6:00 a.m. to 8:00 a.m. For Girls and Female Faculty
		Evening 4:30 p.m. to 7:30 p.m. For Boys and Male Faculty
2.	University Gymnasium 1st Floor, Hari Om Food Plaza Building	Morning 6:00 a.m. to 8:00 a.m. for Boys and Male Faculty
		Evening 4:30 p.m. to 7:00 p.m. For Girls and Female Faculty
3.	Indoor Sports for Boys and Girls	Evening 4:30 p.m. to 7:00 p.m.

You may please contact the Sports and Gymnasium

Coordinator
Contact Person: Mr. Yogesh Jani

Contact Number: (02697) 265036; 9558295583
Contact Email: yogeshjani.sports@charusat.ac.in

🍽 Food 🍽

☞ The campus cafeteria and other food outlets are open every class day, serving breakfast, lunch and snacks. You can bring your own snack/lunch also. The Campus Cafeteria is situated at Lake Side serving multiple cuisine food. The other Fast-Food Outlets like Nescafe and Iceberg are also available at the campus.

For any queries, you may please contact

Contact Person: Mr. Hasmukh Patel

Contact Number: (02697) 265004; 9426500630

Contact Email: hasmukhpatel.adm@charusat.ac.in

13 Financial Information

• Insurance •

CHARUSAT believes in the safety of the students. Hence, it has insured each and every student of the campus with the Group Personal Accident Insurance Policy.

For Further Details, You May Please Contact
Contact Person: Mr. Bhavdip Patel, Chief Accounts Officer
Contact Number: (02697) 265024; 9925946858
Contact Email: bhavdippatel.acc@charusatac.in

• Financial (Aid) Scholarships•

CHARUSAT provides its students with a number of financial support opportunities. These opportunities are exclusively focused on providing support for students whose financial conditions may prevent them from continuing their education.

➢ **Following Scholarship schemes are available which are mentionedbelow**

Name of Scholarship	Beneficiaries
GATE/GPAT Scholarship (By AICTE)	As per Government norms.
Government Scholarship	All students of SC, ST and SEBC category, Free ship card for SC students, Chief Minister Scholarship Scheme, Mukhyamantri Yuva Swavalamban Yojna (MYSY (http://mysy.guj.nic.in/).
MOMA Scholarship	Students belonging to minority communities.
Late Maniben Shankarbhai Patel Scholarship	1st Rank of 2nd, 3rd & 4th year student of B.Sc Nursing Program.
Late Shankarbhai Chhaganbhai Patel Scholarship	1st Rank of 2nd, 3rd & 4th year student of B.Pharm Program.
Late Dahiben Ravjibhai Patel & Dineshbhai Ravjibhai Patel Merit Cum Means Scholarship	Meritorious & Economically Constrained Students of IT branch of CSPIT
Urmil & Mayuri Desai Family Trust Scholarship	Meritorious & Economically Constrained Students of Engineering of CSPIT
Umedbhai Dharamdas Patel (Nar) Charitable Trust Scholarship	Meritorious & Economically Constrained Students of Selected Course
Prof. S G Shah Scholarship	Meritorious & Economically Constrained Students of CSPIT
Late Kamlaben Ambalal bin Becharbhai, Bakrol and Mrs. Pushpaben Dinesh Patel Merit Cum Means Scholarship	Meritorious & Economically Constrained Students of DEPSTAR

For any further queries, you may please contact

Contact Person: Dr.Brijesh Shah

Contact Number: 02697-265112

Contact Email: brijeshshah.ec@charusat.ac.in

PART B
ACADEMIC INFORMATION

Faculty of Technology & Engineering

Chandubhai S. Patel Institute of Technology (CSPIT)

&

Devang Patel Institute of Advance Technology & Research (DEPSTAR)

ACADEMIC REGULATIONS
&
SYLLABUS

(Choice Based Credit System)

Bachelor of Technology Programme

(B.Tech Programme **IT**)

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the c3hoicest destinations by students. It has been transformed into Charotar University of Science and Technology (CHARUSAT) through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. ofIndia.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmers, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are nine different institutes falling under ambit of six different faculties. The programmed offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer different programmers'. A quick glimpse in asunder:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Chandubhai S. Patel Institute of Technology	B. Tech M. Tech Ph. D
	Devang Patel Institute of Advance Technology & Research	B.Tech
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm, M. Pharm MPM, Ph. D PGDCT/ PGDPT
Faculty of Management Studies	Indukaka Ipcowala Institute of Management	M.B.A, PGDM Dual Degree BBA+MBA Ph.D
Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc, M.Phil Dual Degree B.Sc+M.Sc Ph.D

Faculty of Computer Applications	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications	M.C.A/MCA (Lateral) M.Sc IT Dual Degree

Faculty	Institute	Programmes Offered
		BCA+MCA Ph. D
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy	B.PT, M.PT Ph.D
	Manikaka Topawala Institute of Nursing	B.Sc ,M.Sc GNM, Ph.D
	Charotar Institute of Paramedical Sciences	Ph.D PGDHA, PGDMLT

The development and growth of the institutes have already led to an investment of over Rs.63 Crores (INR 630 Million). The future outlay is planned with an estimate of Rs. 250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 100 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 350 core faculty members, educated and trained in Stanford, IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, CHARUSAT has the vision of entering the club of premier Universities initially in the country and then globally. High Moral Values like Honesty, Integrity and Transparency which has been the foundation of ECC continues to anchor the functioning of CHARUSAT. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State

University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute – UK, ISRO, BARC,etc.

- ☞Participatory and interactive discussion-based classes.
- ☞Sessions by visiting faculty members drawn from leading academic institutions and industry.
- ☞Regular weekly seminars.
- ☞Distinguished lecture series.
- ☞Practical, field-based projects and assignments.
- ☞Summer training in leading organizations under faculty supervision in relevant programmes.
- ☞Industrial tours and visits.
- ☞Extensive use of technology for learning.
- ☞Final Placement through campus interviews.

Explorationinthefieldofknowledgethroughresearchanddevelopmentandcomprehensiveindustrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

 **CHARUSAT welcomes you for a Bright Future** 

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (CE/CSE/IT/EC) Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)

CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad,

District: Anand

Phone: 02697-247500, Fax: 02697-247100, Email:

info@charusat.ac.inwww.charusat.ac.in

CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF TECHNOLOGY AND ENGINEERING

ACADEMIC REGULATIONS

Bachelor of Technology

Programmes Choice Based Credit System

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1) System of Education

Choice based Credit System with Semester pattern of education shall be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate andMaster'slevels.Eachsemesterwillbeatleast90workingdayduration.Everyenrolled student will be required to take a course works in the chosen subject of specialization and also complete a project/dissertation if any. Apart from the Programme Core courses, provision for choosing University level electives and Programme/Institutional level electives are available under the Choice based credit system.

2) Duration of Programme

i) **Undergraduate programme (B.Tech)**

Minimum 8 semesters (4 academic years)

Maximum 16 semesters (8 academic years)

3) Eligibility for admissions

As enacted by Govt. of Gujarat from time to time.

4) Mode of admissions

As enacted by Govt. of Gujarat from time to time.

5) Programme structure and Credits

As per annexure – 1 attached

6) Attendance

6.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular sessional few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

6.2 Student attendance in a course should be 80%.

7) Course Evaluation

7.1 The performance of every student in each course will be evaluated as follows:

7.1.1 Internal evaluation by the course faculty member(s) based on continuous assessment, the continuous assessment will be conducted by the respective department/institute.

7.1.2 Final end-semester examination by the University through written paper or practical test or oral test or presentation by the student or a combination of these.

7.1.3 The weightages of continuous assessment and End-semester university examination in overall assessment shall depend on individual course as approved by Academic Council through Board of Studies.

7.1.4 The performance of candidate in continuous assessment and in end-semester examination together (if applicable) shall be considered for deciding the final grade in a course.

7.1.5 In order to earn the credit in a course a student has to obtain grade other than FF.

7.2 Performanceincontinuousassessmentandend-semesterUniversityExamination

7.2.1 Minimum performance with respect to continuous assessment as well as end-semester university examination will be an important consideration for passing

a course. Details of minimum percentage of marks to be obtained in the examinations are as follows.

Minimum percentage marks to be obtained in end-semester University Examination (for applicable course)	Minimum Overall percentage marks to be obtained in each course.
40%	45%

7.2.2 If a candidate obtains minimum required percentage of marks in end-semester university examination in applicable course but fails to obtain minimum required overall percentage of marks, he/she has to repeat the examination till the minimum required overall percentage of marks are obtained.

8) Grade Point System

1. The total of the internal evaluation marks and final University examination marks in each course will be converted to a letter grade on a ten-point scale as per the following scheme:

Table 1 **Grade Point System (UG)**

Range of Marks (%)	**≥80**	**<80 ≥73**	**<73 ≥66**	**<66 ≥60**	**<60 ≥55**	**<55 ≥50**	**<50 ≥45**	**<45**
Grade	AA	AB	BB	BC	CC	CD	DD	FF
Grade Point	10	9	8	7	6	5	4	0

2. The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are calculated as follows:

(i) SGPA = $\sum C_i G_i / \sum C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses in the semester

(ii) CGPA = $\sum C_i G_i / \sum C_i$ where C_i is the number of credits of coursei

G_i is the Grade Point for the course i

and i = 1 to n, n = number of courses of all semesters up to which CGPA is computed.

9) Award of Class

☞ *The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:*

Award of Class	CGPA Range
First Class with Distinction	CGPA ≥ 7.50
First class	7.49 ≥ CGPA ≥ 6.00
Second Class	5.99≥ CGPA ≥ 5.00
Pass Class	4.99 ≥ CGPA ≥ 4.50

Grade sheets of only the final semester shall indicate the class. In case of all the other semesters, it will simply indicate as Pass / Fail.

9. 1. Maximum duration allowed for Completion of a programme

☞ Maximum duration to allow for completion of a particular programme shall not be morethantwicethenormaldurationoftherespectiveprogramme.Forexample, a 6-Semester programme should be completed within not more than 12 semesters.

10) Detention Criteria

☞No student will be allowed to move further in next semester if CGPA is less than 3 at the end of an academic year.

☞A Student will not be allowed to move to third year if he/she has not cleared all the courses of first year.

☞A student will not be allowed to move to fourth year if he/she has not cleared all the courses of first and second year.

11) Transcript

☞A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him/her, grades obtained and the final CGPA.

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(CHARUSAT)

FACULTY OF TECHNOLOGY & ENGINEERING

(FTE)

CHOICE BASED CREDIT SYSTEM

FOR

BACHELOR OF TECHNOLOGY & ENGINEERING

CHOICE BASED CREDIT SYSTEM

With the aim of incorporating the various guidelines initiated by the University Grants Commission (UGC) to bring equality, efficiency and excellence in the Higher Education System, Choice Based Credit System (CBCS) has been adopted. CBCS offers wide range of choices to students in all semesters to choose the courses based on their aptitude and career objectives. It accelerates the teaching-learning process and provides flexibility to students to opt for the courses of their choice and / or undergo additional courses to strengthen their Knowledge, Skills and Attitude.

1. CBCS – Conceptual Definitions / Key Terms(Terminologies)

Types of Courses: The Programme Structure consist of 4 types of courses: Foundation courses, Core courses, Elective courses and Non-credit (audit) courses.

1.1) Foundation Course

These courses are offered by the institute in order to prepare students for studying courses to be offered at higher levels.

1.2) Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. **University Core courses(UC)**:

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme. Environmental science will be a compulsory University core for all Undergraduate Programmes.

B. **Programme Core courses (PC)**:

Programmecorecoursesarecompulsorycoursesofferedbyrespectiveprogramme owners, which must be completed in order to meet the requirements of programme.

1.3) **Elective Courses**

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses (UE):

The pool of elective courses offered across all faculties / programmes. As a general guideline, Programme should incorporate 2 University Electives of 2 credits each (total 4 credits).

B. Institute Elective Course(IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses (PE):

The programme specific pool of elective courses offered by respective programme.

D. Cluster Elective Course (CE):

An 'Elective Course' is a course which students can choose from the given set of functional course/Area or Streams of Specialization options (eg. Common Courses to EC/CE/IT/EE) as offered or decided by the Institute from time-to-time.

1.4) **Non Credit Course (NC) – AUDIT Course**

A ‘Non Credit Course’ is a course where students will receive Participation or Course Completion certificate. This will be reflected in Student’s Grade Sheet but the grade of the course will not be consider to calculate SGPA and CGPA. Attendance and Course Assessment is compulsory for Non Credit Courses.

1.5) **Medium of Instruction**

The Medium of Instruction will be English.

Charotar University of Science & Technology
Chandubhai S Patel Institute of Technology
Department of Information Technology

Vision

To become a front-runner for quality education, development and research in the field of IT.

Mission

- *To prepare next-generation technocrats for societal upliftment.*
- *To inculcate moral and ethical values for building vibrant nation.*

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY												
TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN CE/CSE/IT/EC ENGINEERING												
CHOICE BASED CREDIT SYSTEM												
Sem	**Course Code**	**Course Title**	**Teaching Scheme**					**Examination Scheme**				
			Contact Hours				**Credit**	**Theory**		**Practical**		**Total**
			Theory	**Practical**	**Tutorial**	**Total**		**Internal**	**External**	**Internal**	**External**	
First Year Sem I	MA143	Engineering Mathematics-I	4	0	0	4	4	30	70	0	0	100
	CE143	Computer Concepts & Programming	3	4	0	7	5	30	70	50	50	200
	EE145	Basics of Electronics & Electrical Engineering	3	2	0	5	4	30	70	25	25	150
	IT144	ICT Workshop	0	2	0	2	1	0	0	25	25	50
	PY142	Engineering Physics-I	0	2	0	2	2	0	0	50	50	100
	FS101A	Foundation Course on Mathematics and Physics		2		2	2	0	0	50	50	100
	HS101.02A	Communicative English (Hs Elective-I)	2			2	2	0	0	30	70	100
	Assignment Practices/Student Counselling/Remedial Classes/Library/Sports/Extra-curricular & co-curricular					9						
	Total					**33**	**20**					**800**
First Year Sem II	MA144	Engineering Mathematics-II	4	0	0	4	4	30	70	0	0	100
	CE144	Object Oriented Programming with C++	3	4	0	7	5	30	70	50	50	200
	ME145	Elements of Engineering	3	2	0	5	4	30	70	25	25	150
	PY143	Engineering Physics-II	0	2	0	2	2	0	0	50	50	100
	CL144.02 A	Environmental Sciences	0	2	0	2	2	0	0	30	70	100
	FS102A	Foundation Course on Chemistry and Biology	0	2	0	2	2	0	0	50	50	100
	HS201.02 A – HS210.02 A	Courses on Liberal Arts	2			2	2	0	0	30	70	100
	Assignment Practices/Student Counselling/Remedial Classes/Library/Sports/Extra-curricular & co-curricular					7						
	Total					**31**	**21**					**850**

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)											
	TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT											
Sem	Course Code	Course Title	Teaching Scheme					Credit	Examination Scheme				
			Contact Hours						Theory		Practical/Project		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
SY Sem-3	MA253	Discrete Mathematics and Algebra	4	0	0	0	4	4	30	70	0	0	100
	IT250	Digital Electronics	3	2	0	0	5	4	30	70	25	25	150
	IT251	Java Programming	3	4	0	0	7	5	30	70	50	50	200
	XXXX	University Elective- I	0	2	0	0	2	2	30	70	0	0	100
	IT252	Data Communication & networking	3	2	0	0	5	4	30	70	25	25	150
	HS121.02A	Creativity, Problem Solving and Innovation	2				2	2	30	70	0	0	100
	IT253	Software Group Project-I	0	2	0	0	2	1	0	0	25	25	50
		Assignment Practices/Student Counseling/Remedial Classes	0	6	0	0	4	0	0	0	0	0	0
			15	**12**	**0**	**2**	**31**	**22**	**180**	**420**	**125**	**125**	**850**
SY Sem-4	MA261	Statistical And Numerical Techniques	4	0	0	0	4	4	30	70	0	0	100
	IT254	Computer Architecture & Microprocessor Interfacing	4	2	0	0	6	5	30	70	25	25	150
	IT255	Web Technologies	-	2	0	0	2	1	-	-	25	25	50
	IT256	Data Structures & Algorithms	4	2	0	0	6	5	30	70	25	25	150
	IT257	Database Management System	4	2	0	0	6	5	30	70	25	25	150
	IT258	Software Group Project	0	0	0	2	2	1	-	-	25	25	50
	HS111.02A	Human Value and Professional Ethics	0	2	0	0	2	2	-	-	30	70	100
	XXXXX	University Elective- II	0	2	0	0	2	2	100				100
		Assignment Practices/ Student Counseling/ Remedial Classes	0	6	0	0	4	0	0	0	0	0	0
			16	**16**	**0**	**2**	**34**	**25**	**280**	**420**	**175**	**175**	**850**

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)												
	TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT												
Sem	Course Code	Course Title		Teaching Scheme						Examination Scheme				
				Contact Hours					Credit	Theory		Practical		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
TY Sem -5	IT351	Design & Analysis of Algorithms	3	2	0	0	5	4	30	70	25	25	150
	IT342	Advanced Web Technologies	2	2	0	0	4	3	30	70	25	25	150
	IT343	Operating System	4	2	0	0	6	5	30	70	25	25	150
	IT352	Computer Networks	3	2	0	0	5	4	30	70	25	25	150
	HS 131.02A	Communication and Soft Skill	0	2	0	0	2	2	0	0	30	70	100
		Elective-I	2	4	0	0	6	4	30	70	50	50	200
	IT353	Software Group Project-II	0	0	0	2	2	1	0	0	25	25	50
	IT346	Summer Internship-I	0	0	0	3	3	3	0	0	75	75	150
	Assignment practices/ Student Counseling/ Remedial Classes		0	4	0	0	2	0	0	0	0	0	0
			14	**18**	**0**	**5**	**35**	**26**	**150**	**350**	**305**	**345**	**1100**
TY Sem -6	IT355	Software Engineering	3	2	0	0	5	4	30	70	25	25	150
	IT348	Cryptography & Network Security	4	2	0	0	6	5	30	70	25	25	150
	IT354	Machine Learning	4	4	0	0	8	6	30	70	50	50	200
		Elective-II	3	2	0	0	5	4	30	70	25	25	150
	IT356	Software Group Project - III	0	0	0	2	2	1	0	0	25	25	50
	HS132 .02A	Contributory Personality Development	0	2	0	0	2	2	-	-	30	70	100
	Assignment Practices/Student Counseling/Remedial Classes		2	0	6	0	0	0	0	0	0	0	0
			17	**12**	**0**	**0**	**28**	**22**	**150**	**350**	**175**	**175**	**750**

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)												
	TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT												
Sem	Course Code	Course Title	Teaching Scheme						Examination Scheme				
			Contact Hours					Credit	Theory		Practical		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
Final Year Sem-7	IT441	Data Science	3	2	0	0	5	4	30	70	25	25	150
	IT442	Advanced Computing	3	2	0	0	5	4	30	70	25	25	150
	IT443	Language Processors	4	2	0	0	6	5	30	70	25	25	150
	IT444	Internet of Things	3	2	0	0	5	4	30	70	25	25	150
		Elective III	3	2	0	0	5	4	30	70	25	25	150
	IT445	Software Group Project – IV	0	0	0	4	4	2	0	0	50	50	100
	IT446	Summer Internship-II	0	0	0	3	3	3	0	0	75	75	150
		Assignment Practices/Student Counseling/Remedial Classes	0	6	0	0	2	0	0	0	0	0	0
			16	16	0	7	35	26	150	350	250	250	1000
Final Year Sem-8	IT447	Software Project Major	0	36	0		36	20	0	0	250	350	600
			0	36	0		36	20	0	0	250	350	600

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)					
	LIST OF ELECTIVE SUBJECTS FOR B TECH PROGRAMME IN IT					
ELECTIVES	**Code**	**Elective - I**	**Code**	**Elective – II**	**Code**	**Elective - III**
	IT371	Advanced Java programming	IT378	Wireless Communication and Mobile Computing	IT471	Foundation of Modern Networking
	IT373	Embedded Systems	IT379	Computer Vision	IT473	Artificial Intelligence
	IT374	Python Programming	IT380	Cyber Security	IT474	Blockchain Technologies

HS Elective - I
HS101.01 A - Painting
HS102.01 A - Photography
HS103.01 A - Sculpting
HS104.01 A - Pottery and Ceramic Arts
HS105.01 A - Media and Graphic Design
HS108.01 A - Interior Designing
HS109.01 A – Dramatics
HS110.01 A - Contemporary Dance
HS132 A - Academic English

HS Elective - II
HS122 A - Values and Ethics
HS131 A - Philosophy

HS Elective - III
HS121.02 A - Creativity, Problem Solving and Innovation

HS Elective - IV
HS111.02 A Human Values And Professional Ethics

HS Elective - V
HS131.02 A Communication And Soft Skills

HS Elective - VI
HS132.02 A Contributory Personality Development

B. Tech. (CE/CSE/IT/EC)
Programme

SYLLABI
(Semester – 1)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY
FACULTY OF APPLIED SCIENCES
MA143: ENGINEERINGMATHEMATICS –I
B. TECH. 1st SEMESTER (For all branches)

Credits and Hours:

Teaching Scheme	Theory	Tutorial	Total	Credit
Hours/week	4	0	4	4
Marks	100	-	100	

A. Objective of the Course:

A good engineer has to have an excellent background of Mathematics. Engineering Mathematics is one of the essential tools for learning technology, engineering and sciences. This course lays the foundation for engineering mathematics in subsequent semesters, so that students get a sound knowledge and important aspects of the course. The objectives of the course are to understand concept of:

- applications of differentiation in respective engineering branch
- basics of Matrix Algebra and methods to solve problems
- Complex numbers, their properties and applications to Engineering problems
- solution to algebraic equations

B. Outline of the course:

Sr No.	Title of the unit	Number of hours
1.	Higher order derivatives and applications	16
2.	Complex numbers and Roots of polynomial Equations	14
3	Matrix Algebra- I	12
4.	Partial differentiations	08
5.	Applications of Partial differentiations	10
	Total hours	60

C. Detailed Syllabus:

		Hours (%)
1	**Higher order derivatives and applications:**	**16 (27)**
1.1	Set theory and Function	
1.2	Limit, Continuity, Differentiability for function of single variable and its uses. Mean Value Theorem, Local Maxima and Minima	
1.3	Successive differentiation: n^{th} derivative of elementary functions: rational, logarithmic, trigonometric, exponential and hyperbolic etc.	
1.4	Leibnitz rule for the n^{th} order derivatives of product of two functions	
1.5	Tests of convergence of series viz., comparison test, ratio test, root test, Leibnitz test. Power series expansion of a function: Maclaurin's and Taylor's series expansion.	
1.6	L'Hospital's rule and related applications, Indeterminate forms	
2	**Complex numbers and Roots of polynomial Equations:**	**14 (23)**
2.1	Complex numbers and their geometric representation	
2.2	Complex numbers in polar and exponential forms	
2.3	De Moivre'stheorem and its applications	
2.4	Exponential, Logarithmic, Trigonometric and hyperbolic functions.	
2.5	Statement of fundamental theorem of Algebra, Analytical solution of cubic equation by Cardan's method	
2.6	Analytic solution of Biquadratic equations by Ferrari's method with their applications.	
3.	**Matrix Algebra- I:**	**12 (20)**
3.1	Definition of Matrix, types of matrices and their properties	
3.2	Determinant and their properties	
3.3	Rank and nullity of a matrix	
3.4	Determination of rank	
3.5	The inverse of a matrix by Gauss Jordan method.	
3.6	Solution of a system of linear equations by Gauss elimination and Gauss Jordan Methods.	
4.	**Partial differentiations:**	**08 (13)**
4.1	Partial derivative and geometrical interpretation	
4.2	Euler's theorem with corollaries and their applications	
4.3	Chain rule	
4.4	Implicit functions	
4.5	Total differentials	
5.	**Applications of Partial differentiations:**	**10 (17)**
5.1	Maclaurin's and Taylor's series expansion in two variables	
5.2	Tangent plane and normal line to a surface	
5.3	Maxima and Minima	
5.4	Langrage's method of multiplier	

Hours (%)

5.5 Jacobian

5.6 Errors and approximations

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/tutorials which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Quiz (surprise test) /Oral tests/ Viva/Assignment/Tutorialswill be conducted which carries 10% component of the overall evaluation.

E. Course Learning Outcomes:

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

CO1	develop skill of successive differentiation, utilize appropriate theory and computational techniques to construct Taylor's series with its interval of convergence for using in a variety of applications such as approximating values, creating series representation and behaviour of a functions, use L'Hospital's rule to compute limits of the indeterminate forms.
CO2	perform basic mathematical operations with complex numbers in Cartesian and polar forms, know methods of finding the n^{th} roots of a complex number and solutions of simple polynomial equations, work with functions of complex variable.
CO3	find determinant and inverse of a square matrix, evaluate rank and nullity of a matrix, solve system of linear equations by using concept of matrices which are useful in various fields of engineering.
CO4	evaluate partial derivatives including higher order derivatives, solve problems using the chain rules, Euler's theorem with corollaries, implicit function and total differentials.
CO5	expand any function of two variables in ascending power of variables, solve problems using the techniques of multivariable calculus in various branches of engineering.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	--	-	-	-	2	-
CO2	3	1	-	-	-	-	-	-	--	-	-	-	2	-
CO3	3	2	1	-	2	-	-	-	--	-	-	-	3	1
CO4	3	-	-	-	1	-	-	-	--	-	-	-	2	-
CO5	3	2	1	1	1	-	-	-	--	-	-	-	3	1

Correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

F. Recommended Study Material:

❖ **Text Books:**

1. Erwin Kreyszig; Advanced Engineering Mathematics, 8th Ed., Jhon Wiley & Sons, India, 1999.
2. H. K. Dass and RajnishVerma; Higher Engineering Mathematics, S Chand & Co Pvt Ltd. 2012.
3. B. S. Grewal; Higher Engineering Mathematics, Khanna Publ., Delhi, 2012

❖ **Reference Books:**

1. M. D. Weir *et al.;* Thomas' Calculus, 11th Ed., PearsonEducation, 2008.
2. James Stewart; Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. C. R. Wylie and L. C. Barrett; Advanced Engineering Mathematics. 1982., McGraw-Hill Book Company.
4. Michael D. Greenberg; Advanced Engineering Mathematics. Prentice-Hall, 1988.

❖ **URL Links:**

1. https://ocw.mit.edu/ans7870/resources/Strang/Edited/Calculus/Calculus.pdf
2. http://nptel.ac.in/courses/111107108/
3. http://nptel.ac.in/courses/122101003/
4. http://nptel.ac.in/courses/111104085/

FACULTY OF TECHNOLOGY & ENGINEERING
U & P U. PATEL DEPARTMENT OF COMPUTER ENGINEERING

CE143: COMPUTER CONCEPTS AND PROGRAMMING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	4	-	7	**5**
Marks	100	100	-	200	

Pre-requisite courses:

- Students should know Basics of Computer. No prior Knowledge of Programming is expected.

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to 'C' Language.	02
2.	Constants, Variables & Data Types in 'C'	03
3.	Operators and Expression in 'C'	03
4.	Managing Input & Output Operations	01
5.	Conditional Statements & Branching	03
6	Looping	03
7	Arrays	04
8	Character Arrays and Strings	05
9	User-Defined Function in 'C'	05
10	Structures and Unions	03
11	Pointers	06
12	File Management in 'C'	05
13	Dynamic Memory Allocation	02
	Total hours (Theory) :	45
	Total hours (Lab) :	60
	Total hours :	105

Detailed Syllabus:

1	**Introduction to 'C' language.**	**02 Hours**	**05%**
	Program, Software, Instruction, debugging, compilation and execution of C Program, Difference between Header files & library files, Compiler and Interpreter, Procedure Oriented Language, Importance of C, Basic structure of C, Algorithms & Flowchart.		
2	**Constants, Variables & Data Types in 'C'**	**03 Hours**	**06%**
	Character set, C tokens, Keywords & Identifiers , Data types , Constants, Variables, Declaration of Variables, Assigning Values to Variables, Declaring a variable as Constant, Defining Symbolic constants.		
3	**Operators and Expression in 'C'**	**03 Hours**	**06%**
	Classification of operators: Arithmetic, Relational, Logical, Assignment, Increment / Decrement, Conditional, Bitwise, Special Operators. Unary, Binary and Ternary Operators. Arithmetic expression, Evaluation, Type conversion: Implicit &Explicit, Precedence and Associativity, Various library functions from maths.h.		
4	**Managing Input & Output Operations**	**01 Hours**	**02%**
	Reading a Character, Writing a Character, Various library functions from ctype.h. Formatted Input, Formatted Output		
5	**Decision Making & Branching**	**03 Hours**	**06%**
	Decision making using simple if, if…else statement, nesting of if…else, else…if Ladder. Switch statements, conditional operator, goto statement.		
6	**Looping**	**03 Hours**	**08%**
	Need of looping, (pre-test) entry-controlled loop: while, for, (post-test) exit-controlled loop: do…while, difference between Counter- Controlled loops and Sentinel - controlled loops. Nesting of looping statements, use of break & continue, use of if…else in loop, infinite loop.		
7	**Arrays**	**04 Hours**	**08%**

	Need of array, Declaration & Initialization of 1D array, Programs of 1D. 2D array, Memory allocation of 1D and 2D array, 2D array basic programs.		
8	**Character Arrays and Strings**	**05 Hours**	**10%**
	Difference of character array with numeric array and importance of NULL character. Declaration, Initialization and various input and output methods of string, formatted output of string, arithmetic operations on characters. Various functions of string.h: strlen, strcat, strcmp, strcpy, strrev, strstr, etc. Two dimensional character array (table of strings).		
9	**User-Defined Function in 'C'**	**05 Hours**	**14%**
	Need of modularization, advantages, Introduction to user-defined function, Function Prototype, Function Call, Function Body. Call by value, Actual &Formal Arguments, return value, Categories of functions, Nesting of Functions, Recursion. Array as Function arguments, Storage Classes: Scope, Life of a variable in 'C'.		
10	**Structures and Union**	**03 Hours**	**08%**
	Need of user-defined data type, Structure definition, Declaration and Initialization of variables, Array as member, Array of structure variables. Structure within structure, Structure as function arguments, Union.		
11	**Pointers**	**06 Hours**	**14%**
	Introduction to pointer, declaration & initialization, access value using pointer, indirection (*) operator. Pointers in expressions, scale factor, 1D-array and pointer, pointer with strings, Array of pointers. Pointer as arguments in function, Call by address, Functions returning pointers, Pointers and structures, Chain of Pointers.		
12	**File Management in 'C'**	**05 Hours**	**8%**
	Introduction, Defining and Opening a file, closing a file, modes of file, read & write single character and integer to file, use of fprintf and fscanf functions. Error handling functions, random		

	access of files using ftell, rewind, fseek, command line argument.		
13	**Dynamic Memory Allocation**	**02 Hours**	**05%**
	Introduction, memory allocation process. Use of functions: malloc ( ), calloc ( ), realloc ( ) and free ( ).		

Course Outcome (COs):

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

CO1	Demonstrate problem solving skills by developing algorithms and drawing flowcharts to solve simple problems, Understand the process of compiling and executing a C program and recognize various C tokens and datatypes.
CO2	Understanding various programming constructs and applying it for the problems given in hand.
CO3	Demonstrate the use of various data structures like array, file and structure.
CO4	Applying the concepts of top-down modular programing to decompose problem and a program solution into smaller pieces and Analyse how length of the source program can be reduced by using functions.
CO5	Evaluate how pointers are effective in handling arrays, functions and data tables and how pointers support Dynamic memory management.
CO6	Develop C Programs using various methods described above to solve real-world problems.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	1	2	2	1	1	2	-
CO2	3	3	2	-	-	-	-	-	1	-	-	2	3	-
CO3	3	2	2	-	-	-	-	-	1	-	-	2	3	-
CO4	3	3	3	-	-	-	-	-	2	-	-	3	3	-
CO5	3	3	3	-	-	-	-	-	2	-	-	3	3	-
CO6	3	3	3	-	-	-	-	-	2	-	1	3	3	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

Recommended Study Material:

- **Text book:**
  1. Programming in ANSI C, 8th Edition by E Balagurusamy, MGrawHill
  2. Let us C, 16th Edition by Yashwant Kanetkar, BPB Publication
  3. Programming in C , 2nd Edition by Pradeep Dey & Manas Ghosh

- **Reference book:**
  1. Head First C by David Griffiths & Dawn Griffiths.
  2. C How to program, 7/E by Deitel&Deitel, Prentice Hall
  3. C: The Complete Reference by Herbert Schildt
  4. Practical C Programming (Third Edition) by Steve Oualline
- **Web material:**
  1. www.tutorials4u.com/c/
  2. www.cprogramming.com/tutorial.html
  3. www.howstuffworks.com/c.htm
  4. http://www.programmingtutorials.com/c.aspx
  5. http://www.physics.drexel.edu/courses/Comp_Phys/General/C_basics/
- **Software:**
  1. Code::Blocks
  2. Turbo C

EE145: BASICS OF ELECTRONICS & ELECTRICAL ENGINEERING

A. Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

B. Examination Scheme:

Theory Marks		Practical Marks		Total Marks
Internal	External	Internal	External	
30	70	25	25	150

C. Course Objectives:

This course covers the basic principles and laws of electrical and electronics engineering with emphasis on the analysis and application to simple practical engineering problems.

The course objectives (CO) are to:

a. Introduce basic terms and units related to electrical engineering.
b. Understand the basic concepts in the field of electrical and electronics engineering.
c. Focus on the fundamentals of electrostatic and electromagnetism.
d. Analyze the series AC systems.
e. Solve single phase and poly phase circuits.
f. Comprehend electronic devices, digital numbers, logic gates and communication systems.

D. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Basic Electrical Terms and Units	04
2	Electrical Circuit Analysis	07
3	Electrostatic	08
4	Electromagnetism	05
5	AC Fundamentals	05
6	Single Phase AC Series Circuits	05
7	Polyphase Circuits	04
8	Basics of Electronics	07

Total hours (Theory)	:	45 Hrs
Total hours (Lab)	:	30 Hrs
Total hours	:	75 Hrs

E. Detailed Syllabus

1	**Basic Electrical Terms and Units**	**04 Hours**	**08%**
1.1	Ohm's law, resistor and its coding, properties, temperature co- efficient of resistance, resistance variation with temperature, examples		
2	**Electrical Circuit Analysis**	**07 Hours**	**15%**
2.1	Kirchhoff's current and voltage law, mesh and nodal analysis, Examples		
2.2	Series parallel circuits, star-delta transformation		
3	**Electrostatic**	**08 Hours**	**18%**
3.1	Capacitors, charge and voltage, capacitance, electric fields, electric field strength and electric flux density, relative permittivity, dielectric strength, Examples		
3.2	Capacitors in parallel and series, Calculation of capacitance of parallel plate and multi plate capacitor, examples		
4	**Electromagnetism**	**05 Hours**	**12%**
4.1	Magnetic field, its direction and characteristics, magnetic flux and flux density, magneto motive force and magnetic field strength, examples		
4.2	Faraday's law of electromagnetic induction, Fleming's left hand and right hand rule, Lenz law, force on a current carrying conductor, examples		
4.3	Self and mutual inductance		
5	**AC Fundamentals**	**05 Hours**	**12%**
5.1	AC Waveform and definition of its terms, relation between speed and frequency		
5.2	Average and RMS value and its determination for sinusoidal wave shapes, examples		
6	**Single Phase AC Series Circuits**	**05 Hours**	**12%**
6.1	R–L and R-C series circuit, power in ac circuits, examples		
6.2	R-L-C series circuit, resonance in R-L-C series circuit, relevant examples		
7	**Polyphase Circuits**	**04 Hours**	**08%**
7.1	Phase sequence, voltage and current relations in star and delta connected system		
8	**Basics of Electronics**	**07 Hours**	**15%**
8.1	Electronic Systems: Basic amplifier, voltage, current and power gain, Basic attenuators, CRO		
8.2	Transmission and Signals: Analog and digital signals, bandwidth,		
8.3	Forward and reverse bias of PN junction diode, Zener diode		
8.4	Rectifiers: Half Wave, Full Wave - Centre Tap, Bridge		

8.4 Transistor: Bipolar junction transistor, construction and biasing, configuration

F. Revised Bloom's Taxonomy

The below specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from the below table.

Level					
Remembrance	**Understanding**	**Application**	**Analyze**	**Evaluate**	**Create**
25	25	10	20	10	10

G. Course Outcomes (Learning Outcomes):

On the completion of the course one should be able to:

1. Describe resistors, capacitors and inductors properties, readings and calculation. (PO-1,2, PSO1)
2. State the basic electrical laws and apply these laws to solve electrical network. (PO-1,2, PSO1)
3. Identify the property of magnetic materials and understand the laws of emf generation. (PO-1,2, PSO1)
4. Solve the series and parallel DC circuits and AC circuits for single and poly-phase networks. (PO-1,2,4, PSO1)
5. Develop skill and design AC-DC rectification circuits, operate basic electrical and electronics instruments. (PO-1,2,3,5, PSO1)

Mapping of course outcomes with program outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	3	-	-	-	-	-	-	-	-	-	-	1	-
CO4	1	2	-	2	-	-	-	-	-	-	-	-	3	-
CO5	1	2	3	-	3	-	-	-	-	-	-	-	3	-

H. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, pre-requisite of the subject will be

discussed.

- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

- **Recommended Study Material:**

❖ **Text Books:**

1. Elements of Electrical Engineering and Electronics by U.A.Patel and R. P. Ajwalia
2. A Text Book of Electrical Technology by B. L. Thareja, S. Chand
3. Principles of Electrical Engineering and Electronics by V. K. Mehta, S. Chand

❖ **Reference Books:**

1. Electrical Technology by Hughes, Pearson Education.
2. Electrical Engineering Fundamentals by Vincent Del Toro, Pearson Education.

❖ **Web Material**

1. https://www.electronics-tutorials.ws/

List of Experiments

1. To Study various electrical symbols and electrical instruments.
2. To perform of Kirchhoff's laws.
3. To perform circuit analysis for series and parallel connection of resistors.
4. To perform of STAR-DELTA relationship of resistances.
5. To perform charging and discharging of a capacitor.
6. To perform AC series R-L, R-C and RLC circuit.

7. To perform AC parallel R-L, R-C and R-L-C circuit.
8. To perform measurement of the electrical power in a single phase ac circuit using Voltmeter-Ammeter method and Wattmeter method.
9. To study P-N junction diode and Zener diode.
10. To perform rectification by different rectifiers.

I. Course Assignments:

	% weightage (Approx.)
Midterm exams	**20**
Final exams	**70**
Assignments	**10**

J. Course Assessments & Course Outcomes matrix (LOs or CLOs)

Assessment Methods	**COs or LOs**
Lab activity	CO No: 1 to 5
1st Midterm exam	CO No: 1,2,3
2nd Midterm exam	CO No: 4,5
Final exam	CO No: 1 to 5

K. Teaching Methods & Learning Activities: (tick the applicable activities)

Telling/Explaining	✓	Collaborating	
Questioning	✓	Experiments	✓
Reading	✓	Oral Presentations/Reports	
Demonstrating	✓	Web Searching	✓
Problem Solving	✓		

L. Assessment Methods (Formal & Informal) (tick the applicable activities)

Test/Exam	✓
Quiz	✓

M. Student Work load: (Total 120 Hours)

Course Readings	20 hrs	Exams/Quizzes	10 hrs
Problem Solving	10 hrs	Lectures	45 hrs
Experiment	30 hrs.	Lab Pre work/Report	05 hrs

IT144: ICT WORKSHOP

A. Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	0	2	0	2	1
Marks	0	50	0	50	

B. Objective of the Course:

The main objectives for offering the course ICT Workshop are:

1. To explain the fundamentals of computers and peripherals.
2. To introduce hardware and software computer basics.
3. To deliver the concept and methodology of different parts of the computer and their assembling.
4. To brief the students regarding various operating systems installation, commands and scripting in OS.
5. To introduce the basic concepts of batch file programming and its uses.

C. Outline of the Course

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to computer hardware	2
2	PC troubleshooting	2
3	Display unit, Keyboard, Mouse, and TouchPad, Printer	2
4	Power supply & Storage Devices, Assembling the computer system	4
5	Installation of various Operating Systems, DOS Commands	4
6	LINUX commands and scripting	6
7	Professional Document writing using Word Processing Tool, Data Processing using SpreadSheet, Creating Dynamic and Informative Slide Show using Presentation Software	6
8	Batch File Commands & Programming in Windows	4

Total Hours (Lab): 30

Total Hours: 30

D. Detailed Syllabus:

The following contents will be delivered to the students during laboratory sessions.

1.	**Introduction to computer hardware** Definition of computer, Computer hardware, software and firmware, history of computer, classification of computer, basic parts of digital computer	2 Hours	7%
2.	**PC troubleshooting** Hardware troubleshooting and repairing, Software troubleshooting and repairing	2 Hours	7%
3.	**Display unit** Types of monitor: CRT, LCD, LED, Plasma, OLED, Faults of monitor, Display card **Keyboard , Mouse and Touch Pad (Track Pad)** Types of keyboard: Wired and Wireless Wired: Din type, PS/2, USB, Wireless: Bluetooth, Infrared(IR), RF Types of mouse: Wired and Wireless Wired: Serial port, PS/2, USB, Wireless: Bluetooth, Infrared(IR), RF Types of Track pad and Touch pad **Printer** General features of printer, Classification of printer, Impact printer: Dot matrix, Line printer, Non-impact: Thermal	2 Hours	7%
4.	**Power supply& Storage Devices** SMPS: Working, output connectors, UPS, Stabilizer Types of Memory: Primary storage: Registers, Cache, RAM Other Storage Devices: Floppy, Hard Disk, CD, DVD, Flash **Motherboard** Types of motherboard, Functional block diagram of motherboard, CPU and supporting chips, the introduction of CPU architectures, BIOS, CMOS setup, Faults of the motherboard **Assembling the computer system** Study of the configuration of a computer system, introduction of computer assembling, Different types of cables, Assembling and Disassembling	4 Hours	13%
5.	**Installation of various Operating Systems** Different types of Operating System, Installation of OS on a single machine (Dual Boot) **DOS Commands:** Internal Commands: CLS, DATE, VER, VOL, DIR, COPY CON, TYPE, MKDIR, CHDIR (CD), RMDIR, RENAME, DEL, MOVE, COPY, PROMPT, DOSKEY, PATHExternal Commands: ATTRIB, FORMAT, CHKDSK, SCANDISK, TREE, XCOPY. Use of commands with Wild Card Characters:? (Question Mark) and *(Asterisk)	4 Hours	13%

6.	**LINUX Commands and scripting:** Introduction to basics of Linux OS and its variants, what is shell, Commands:clear, man, who, date, who am i, cal, echo, ls, mkdir, cd, cd.., rmdir, pwd, cat, rm, cp, mv, chmod, umask, grep, ps Prepare scripts using control structures and loops for various actions to perform.	**6 Hours**	**20%**
7.	**Professional Document writing using Word Processing Tool** Microsoft Word: Basic menu introduction, Page layout-Margin-Header Footer, Page break, Insert symbols and Equations, Mail Merge, Preparation of Index, Automatic Index generation, Two columns research paper format-Footnote-Cross reference. **Data Processing using Spread Sheet** Microsoft Excel: Cell Address, Row, Column, Header and Footer, Fill handle and drag-&-drop, Format cells, Conditional formatting, Formulas and Functions, Validation, Chart with various options, Filter, Sort. **Creating Dynamic and Informative Slide Show using Presentation Software** Microsoft PowerPoint: Slide layout, Slide design (Proper selection based on audience), Header and Footer in slides, Slide transition, Slide Master, Insert Picture-Smart Art, Insert animations to different objects, Hide Slide, Rehearse Timings, Record slide show. How to prepare professional presentation	**6 Hours**	**20%**
8.	**Batch File Commands & Programming in Windows** Batch file commands: CLS, %1, ECHO, SET, CALL, :LABEL, EXIT, GOTO, IF, FOR, REM, etc. Create batch files for various purposes and execute it, study of AUTOEXEC.BAT file	**4 Hours**	**13%**

E. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Laboratories will be conducted with the aid of multi-media projector, white board, computers, OHP etc.
- Attendance is compulsory in laboratory. This, including assignments/tests/quizzes carries 10 marks in overall evaluation.

F. Student Learning Outcomes:

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

CO1	A student will be having the basic knowledge of computer architecture, peripherals and all the hardware and software basics.
CO2	A student will be able to understand hardware requirement for operating system and able to install it on a machine.
CO3	Analyze and generate the different parsing techniques.

CO4	A student will become familiar with command line interface of Windows and Linux.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	1	-	-	-	1	-	-	-	-	-	-	2	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	3	1	-
CO4	3	-	-	-	1	1	-	-	-	-	-	-	2	-	-

G. Recommended Study Material:

❖ **Reference Books:**

1. The Complete PC Upgrade and Maintenance Guide, 16th Edition, Mark Minasi, Quentin Docter, Faithe Wempen, SYBEX publication
2. IBMPC And Clones Govindarajulu, Tata McGraw Hill

❖ **Web Materials:**

1. http://www.technologystudent.com/elec1/resist1.htm
2. http://www.electronics-tutorials.ws/capacitor/cap_1.html
3. http://en.wikipedia.org/wiki/Inductor
4. http://www.radio-electronics.com/info/formulae/inductance/inductor-inductive-reactance-formulae-calculations.php
5. http://alternatezone.com/electronics/files/PCBDesignTutorialRevA.pdf
6. http://www.scribd.com/doc/39508404/CRO-Manual
7. http://www.computerhope.com/issues/ch001676.html

FACULTY OF APPLIED SCIENCES
DEPARTMENT OF PHYSICS
PY142: ENGINEERING PHYSICS - I

A. Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	-	2	-	2	2
Marks	-	50 (Internal) + 50 (External) =100	-	100	

B. Objective of the Course:

This is a basic physics lab covering the fundamental laws and phenomena in mechanics, electromagnetism, light and optics and modern Physics. Following are the specific objectives of the course.

1. The course will help in reinforcing the concepts of physics through conceptual and experiential learning.
2. Develop experimental and analytical skills for both theoretical problems and data
3. Understand the role of direct observation as the basis for knowledge in physics
4. Appreciate scientific inquiry into exploring creatively how the world works
5. Develop collaborative learning skills through cooperative work

C. Outline of the Course:

Unit No.	Title of the Unit	Minimum number of Hours
Unit 1	Mechanics Lab	16
Unit 2	Thermodynamics Lab	14
		Total Hours (Practical): 30

D. Detailed Syllabus:

1	**Mechanics:** **1.1 Uncertainties in Measurements:** Sources and estimation of errors, accuracy and precision, systematic error, random error, Significant figure and round off, error propagation **1.2 Laws of Motion:** Frames of reference. Newton's Laws of motion, Dynamics of a system of particles, Centre of Mass, Projectile motion **1.3 Collisions:** Elastic and inelastic collisions between particles **1.4 Momentum and Energy:** Conservation of momentum, Work and energy, Conservation of energy. Motion of rockets **1.5 Rotational Motion:** Angular velocity and angular momentum. Torque. Conservation of angular momentum	**16 hours**

	1.6 Elasticity: Hooke's law - Simple Stress and Strain: Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants	
	No. of Experiment 1. Understanding Errors and Uncertainties in the measurements 2. Conservation of Energy, Hook's law 3. Young modulus and elasticity **4.** To determine g by Bar Pendulum and Kater's Pendulum.	
2	**Thermodynamics:** **2.1** Zeroth Law of thermodynamics and temperature **2.2** First law, second, third law and internal energy, conversion of heat into work **2.3** Various Thermo dynamical Processes, Enthalpy, Gibbs, Helmholtz and Internal Energy functions, **2.4** Transport Phenomena: Viscosity, Conduction and Diffusion, **2.5** Applications to specific heat of gases and metals, **2.6** Blackbody radiation, Spectral distribution, Derivation of Planck's law	**14 hours**
	No. of Experiment 1. Specific Heat of Metals 2. Thermal conductivity of materials by Searl's apparatus 3. Heat Transfer and Newton's Law of Cooling 4. Radiation from a black body: Stefan-Boltzmann Law	

E. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Section wise Online Quiz will be taken.
- Lab manual: Student will be required to read the lab material prior to the start of class. A way to ensure this is by lab quizzes and assignments.
- Lab Reports: Student has to write lab reports and submit them hardcopy/electronically. The purpose of this exercise is both to demonstrate your work in lab and to guide you to think a bit more deeply about what you are doing. The act of technical writing also helps improve your communication skills, which are broadly relevant far beyond the physics la

F. Student Learning Outcome:

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

CO1	Students will be able to apply and demonstrate the concepts of mechanics to practical engineering problems.
CO2	Understand the basic concepts of thermodynamics such as internal energy, thermodynamic properties, transport phenomena, blackbody radiation.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	1	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PY142	3.00	3.00	2.00	1.50	1.00	-	-	-	-	-	-	-	-	-	-

G. Recommended Study Material:

❖ Text Books:

1. Physics for Scientists and Engineers by Randall D. Knight, 4th Edition, Pearson
2. University Physics by Hugh D. Young, Roger A. Freedman and A. Lewis Ford, 13th Edition, Pearson
3. Physics by John D. Cutnell& Kenneth W. Johnson, 8th Edition, John Wiley & Sons, Inc.

❖ Reference Books:

1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
3. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, 2010, Cengage Learning
5. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
6. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, 2nd Ed., 2012, Oxford University Press

❖ Web Materials:

1. Uncertainty and error in measurement - https://www.youtube.com/watch?v=pWEflsClyTk
2. Vernier Callipers principle and description (Introduction) - https://www.youtube.com/watch?v=ySRN3yuZUT0
3. Hooke's law - https://www.youtube.com/watch?v=PWQm4ynYVSE
4. Law Of Conservation Of energy in a Simple Pendulum - https://www.youtube.com/watch?v=51RCyBr_nGk, https://www.youtube.com/watch?v=QlViWmQcwpQ
5. Young's modulus of the material of a beam by method of bending of beam - https://www.youtube.com/watch?v=iUhfstf10rk
6. Bar pendulum - https://www.youtube.com/watch?v=3uZ_Boyt_AI

7. Kater’s Pendulum - https://www.youtube.com/watch?v=TxbDyv17Jfs
8. Specific Heat of Metals - https://www.youtube.com/watch?v=8gHFaL2990U
9. Thermal conductivity of materials by Searl's apparatus - https://www.youtube.com/watch?v=qKhhcrqhPfY
10. Newton’s Law of Cooling - https://www.youtube.com/watch?v=lC9o6ikJlR8
11. Radiation from a black body: Stefan-Boltzmann Law - https://www.youtube.com/watch?v=riRsMfNmicM

B. Tech. (CE/CSE//IT/EC) Programme

SYLLABI

(Semester – 2)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY
FACULTY OF APPLIED SCIENCES
MA144: ENGINEERING MATHEMATICS – II
B.TECH. 2nd SEMESTER (For all branches)

Credits and Hours:

Teaching Scheme	Theory	Tutorial	Total	Credit
Hours/week	4	0	4	4
Marks	100	0	100	

G. Objective of the Course:

A good engineer has to have an excellent background of Mathematics. Engineering Mathematics is one of the essential tools for learning technology, engineering and sciences. This course lays the foundation for engineering Mathematics in subsequent semesters, so that students get a sound knowledge and important aspects of the course. The objectives of the course are to understand concept of:

- differential equations, partial differential equations and its solutions
- multiple integration and solution techniques
- Matrix Algebra
- basic probability and statistics

H. Outline of the course:

Sr. No.	Title of the unit	Number of hours
1.	First order and First degree Ordinary Differential Equations	08
2.	Higher Order Ordinary Linear Differential Equations	12
3.	Partial Differential Equations and Applications	10
4	Matrix Algebra –II	10
5.	Improper and Multiple Integrals	10
6.	Probability and Statistics	10
	Total hours	**60**

I. Detailed Syllabus:

		Hours (%)
1.	**First order and First degree Ordinary Differential Equations:**	08 (13)
1.1	Modeling of real world problems in terms of first order ODE	
1.2	Concept of general and particular solutions	
1.3	Initial value problems	
1.4	Existence and Uniqueness of solutions by illustrations	
1.5	Solutions of first order and first degree differential equations	
1.6	Linear, Bernoulli, Exact and non-exact differential equations	
2.	**Higher Order Ordinary Linear Differential Equations:**	12 (20)
2.1	Model of real world problems of higher order LDE	
2.2	General Solution of Higher Order Ordinary Linear Differential Equations with Constant coefficients	
2.3	Methods for finding particular integrals viz. variation of parameters and undetermined coefficients	
2.4	LDE of higher order with variable coefficients: Legendre's Equations (Special case: Cauchy-Euler equation)	
2.5	System of simultaneous first order linear differential equations	
3.	**Partial Differential Equations and Applications:**	10 (17)
3.1	Boundary valued problems	
3.2	Methods of solutions of first order PDE	
3.3	Lagrange's Linear Partial Differential Equations.	
3.4	Special types of Nonlinear PDE of the first order	
3.5	Solutions of Heat, Wave and Laplace equations using separation of variables.	
3.6	Modeling of real world problem in terms of PDE	
4.	**Matrix Algebra –II:**	10 (17)
4.1	Revision of matrices, determinant	
4.2	Eigenvalues and Eigenvectors of matrices	
4.3	Eigenvalues and Eigenvectors of special matrices	
4.4	Cayley-Hamilton's Theorem and its applications.	
4.5	LU decomposition	
5.	**Improper and Multiple Integrals:**	10 (17)
5.1	Improper integrals and their convergence	
5.2	Definitions, properties and examples of Gamma, Beta and Error functions	
5.3	Evaluation of double and triple integrals	
5.4	Change of order of double integration	
5.5	Transformation to polar and cylindrical coordinates	
5.6	Applications of double and triple integrals	

6. Probability and Statistics: 10 (16)

6.1 Mean, median, mode and standard deviation

6.2 Combinatorial probability

6.3 Joint and Conditional probability and Bayes theorem

6.4 Random variables, probability distribution functions - Binomial, Poisson, exponential and normal.

J. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/tutorials which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Quiz (surprise test) /Oral tests/ Viva/Assignment/Tutorials will be conducted which carries 10% component of the overall evaluation.

K. Student Learning Outcomes

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

CO1	Formulate models of natural phenomena using differential equations and find its solution using standard methods.
CO2	Identify, analyze and subsequently solve physical problems analytically whose behaviour can be described by linear and nonlinear differential equations.
CO3	Find and explain significant of Eigenvalues and Eigenvectors of a square matrix, use Cayley-Hamilton's theorem to find inverse and power of a square matrix, construct LU decomposition of a square matrix.
CO4	Use advanced techniques to evaluate improper integrals, apply multiple integrals to find area, volume and mass in engineering field.
CO5	Recognize the difference between different measure of central tendency, summarize and interpret data.
CO6	Understand and solve the problems using probability axioms, rules and Bayes theorem, use distributions such as Binomial, Poisson, Exponential and Normal to solve real world problems.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	3	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	1	1	-	-	-	-	-	-	-	2	1

CO6	2	2	1	2	1	1	1	-	-	-	-	-	2	1

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

L. Recommended Study Material:

❖ Text Books:

1. Erwin Kreyszig; Advanced Engineering Mathematics, 8th Ed., Jhon Wiley & Sons, India, 1999.
2. H. K. Dass and Rajnish Verma; Higher Engineering Mathematics, S Chand & Co Pvt. Ltd.
3. Sheldon Ross; A first course in probability. Pearson, 2014.
4. B. S. Grewal; Higher Engineering Mathematics, Khanna Publ., Delhi, 2012

❖ Reference Books:

1. M. D. Weir et al*;* Thomas' Calculus, 11th Ed., Pearson Education, 2008.
2. James Stewart; Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. C. R. Wylie and L. C. Barrett; Advanced Engineering Mathematics. 1982, McGraw-Hill Book Company.
4. Michael D. Greenberg; Advanced engineering mathematics. Prentice-Hall, 1988.
5. R. V. Hogg, E. A. Tanis and D. L. Zimmerman; Probability and Statistical Inference, 9th edition, Prentice Hall, 2015.
6. Zafar Ahsan; Differential Equations and Their Applications, φ Learning, Pvt Ltd,Third Edition (2017).

❖ URL Links:

1. http://nptel.ac.in/courses/122107037/
2. http://nptel.ac.in/courses/111107108/
3. http://nptel.ac.in/courses/122103012/
4. http://nptel.ac.in/courses/122104018/
5. http://nptel.ac.in/courses/111106100/
6. http://nptel.ac.in/courses/122101003/
7. https://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/lecture-notes/
8. https://nptel.ac.in/courses/111105041/

FACULTY OF TECHNOLOGY & ENGINEERING
U & P U. PATEL DEPARTMENT OF COMPUTER ENGINEERING

CE144: OBJECT ORIENTED PROGRAMMING WITH C++

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	4	0	7	**5**
Marks	100	100	0	200	

Pre-requisite courses:

- Basic knowledge of C Programming

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Principles of object-oriented Programming	02
2.	Introduction of C++	03
3.	Tokens and Expressions & Control Structure	02
4.	Functions	04
5.	Classes and objects'	07
6	Constructor and Destructors	03
7	Operator Overloading	06
8	Inheritance	06
9	Pointers and Virtual Functions	06
10	Managing Console I/O Operations	02
11	Working with Files	04
	Total hours (Theory) :	45
	Total hours (Lab) :	60
	Total hours :	105

Detailed Syllabus:

1	**Principles of object-oriented Programming**	**02 Hours**	**5%**
	Basic concept of object-oriented Programming, Benefits of OOP, Difference between object oriented language and procedure oriented language		
2	**Introduction of C++**	**03 Hours**	**3%**
	What is C++, Simple C++ Program, Applications of C++ Introduction to class, object and creating simple program using class, Structure of C++ program		
3	**Tokens and Expressions & Control Structure**	**02 Hours**	**4%**

	Type compatibility, Dynamic initialization, Reference variables Scope Resolution Operator, Memory Management, Operator, Manipulators, Type cast operator		
4	**Functions**	**04 Hours**	**8%**
	The main function, simple functions, call by reference, return by reference, inline functions, overloaded functions, default arguments		
5	**Classes and objects**	**07 Hours**	**16%**
	Limitation of C structure, declaring class and defining member function, making outside function inline, Nesting member function, Private member function arrays within a class, memory allocation of objects, Static data members and Member functions, Arrays of Objects, Object as a function argument, Friend functions, Returning objects, const Member functions.		
6	**Constructor and Destructors**	**03 Hours**	**9%**
	Introduction to Constructors, Parameterized Constructors, Multiple Constructors in class, Constructors with default argument, Dynamic initialization of Constructors, Dynamic Initialization of objects, Copy Constructor, Dynamic Constructor, Destructors		
7	**Operator Overloading**	**06 Hours**	**11%**
	Introduction, Defining Operator overloading, overloading unary and binary operators, overloading binary operator using friend function, rules for overloading operators, Type Conversion		
8	**Inheritance**	**06 Hours**	**13%**
	Introduction, Defining a derived class, Example of Single, Inheritance, Public and private inheritance. Multilevel, multiple and hierarchical Inheritance, Hybrid Inheritance Virtual Base Class, abstract class nesting of classes, constructors in derived classes		
9	**Pointers and Virtual Functions**	**06 Hours**	**16%**
	Introduction, pointer to object, this pointer, pointer to derived class, Virtual functions, pure virtual functions		
10	**Managing Console I/O Operations**	**02 Hours**	**5%**
	Introduction, C++ stream, C++ stream classes, Unformatted and formatted console I/O Operations		
11	**Working with Files**	**04 Hours**	**10%**
	Introduction, Classes for file stream operations, Opening and closing a file, Detecting End of File, File modes, file pointers and their manipulations, Sequential I/O operations, Error Handling during File operations, Command-line arguments		

Course Outcome (COs):

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

CO1	Comprehend the difference between the top-down and bottom-up approach

CO2	Explain how C++ improves C with object-oriented features.
CO3	Acquire a knowledge of the syntax and semantics of the C++ programming language.
CO4	Recognize and apply features of object oriented design such as encapsulation, polymorphism, inheritance and data abstraction of systems based on object identity.
CO5	Apply and Illustrate the Process of virtual, pure virtual function, data file manipulations Using C++ and complex programming situations
CO6	Evaluate, write, debug, and test basic C++ codes using the approaches introduced in the course.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	-	1	-	-	-	-	-	1	-
CO2	1	1	1	-	1	-	-	-	-	-	-	-	1	-
CO3	2	1	3	-	3	-	-	-	-	-	-	1	1	-
CO4	3	3	3	1	3	2	2	-	-	-	-	1	3	1
CO5	3	2	2	-	3	1	1	-	1	-	1	2	2	1
CO6	2	2	3	-	3	1	-	-	1	-	2	3	3	1

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

Recommended Study Material:

- **Text book:**
  1. Programming with C++ by E.Balagurusami(TMH)
  2. Object Oriented Programming in Turbo C++ by Robert Lafore (Galgotia)

Reference book:

1. Let us C++ by Yashwant Kanetkar, BPB Publication
2. C++ How to program, by Deitel & Deitel, Prentice Hall
3. C++ Programming Bible, by Al Stevens and Clayton Walnum, Prentice Hall
4. The Complete Reference, by Herbert Schildt, Tata McGraw Hill

- **Web material:**
  1. http://www.stroustrup.com/C++.html
  2. http://www.cplusplus.com/doc/tutorial/
  3. http://www.learncpp.com/
  4. http://www.cprogramming.com/tutorial/c++-tutorial.html
  5. http://www.tutorialspoint.com/cplusplus/index.html
- **Software:**
  1. Code::Blocks
  2. Dev-C++
  3. Turbo C++

FACULTY OF TECHNOLOGY & ENGINEERING

CHAMOS MATRUSANSTHA DEPARTMENT OF MECHANICAL ENGINEERING

ME145: ELEMENTS OF ENGINEERING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

This course covers the basics of mechanical and civil engineering. The principles and application of the two core branches of engineering is covered along with the fundamentals of engineering drawing. The objectives of the course are to:

1. Introduce the universal language and tool of communication for engineers and understand the concepts, elements & grammar of engineering drawing**.**
2. Introduce the important aspects and applications of mechanical engineering and explain the working of different mechanical systems.
3. Recognize the scope and basic elements of civil engineering.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum nos. of hrs
Part: A		
1.	Fundamentals of Engineering Graphics	05
2.	Projections & Section of Solid	05
3.	Orthographic Projection	05
4.	Isometric Projections	05
5.	Computer Graphics	03
Part: B		
6.	Introduction of Mechanical Engineering	02
7.	Steam and Steam Generator	03
8.	Internal Combustion Engines	03

9.	Refrigeration and Air Conditioning Systems	03
Part: C		
10.	Scope of Civil Engineering	02
11.	Introduction to Surveying	04
12.	Elements of building Construction	05

Total hours (Theory): 45

Total hours (Practical): 30

Total hours: 75

C Detailed Syllabus:

Part: A

1 Fundamentals of Engineering Drawing 05 Hours 11 %

1.1 Importance of engineering drawing, drawing instruments and materials, BIS and ISO

1.2 Different types of lines used in engineering practice, methods of projections as per SP 46-1988.

1.3 Engineering scale.

1.4 Engineering curve.

2 Projections & Section of Solid 05 Hours 11 %

2.1 Projection of solids

2.2 Sectional view

2.3 True shape of Sections

2.4 Auxiliary Inclined Plane (AIP), Auxiliary Vertical Plane (AVP)

3 Orthographic Projection 05 Hours 11 %

3.1 Principle projection

3.2 Methods of first and third angle projection with examples / problems

4 Isometric Projections 05 Hours 11 %

4.1 Terminology, Isometric scale

4.2 Isometric view and Isometric projection with examples / problems

5 Computer Graphics 03 Hours 7 %

5.1 Introduction of computer graphics

5.2 Demonstration of CAD Modeling software

5.3 Training of Fusion 360 software

Part: B

6 Introduction of Mechanical Engineering 02 Hours 4 %

6.1 Prime movers and its types, Sources of energy

6.2	Basic terminology: Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Interchange of heat, Change of state, Internal energy, Enthalpy, Entropy, Efficiency		
6.3	Zeroth Law and First Law of Thermodynamic, Boyle's law, Charle's law and Combined gas law, Relation between Cp and Cv		
7	**Steam and Steam Generator**	**03 Hours**	**7 %**
7.1	Introduction to steam formation and its types		
7.2	Introduction to steam table		
7.3	Boiler definition and its classification		
7.4	Cochran boiler.		
8	**Internal Combustion Engines**	**03 Hours**	**7 %**
8.1	Introduction		
8.2	Basic terminology of I.C. engine		
8.3	Types of I. C. engines		
9.	**Refrigeration and Air Conditioning Systems**	**03 Hours**	**7 %**
9.1	Introduction to refrigeration and air conditioning		
9.2	Basic terminology, Principal and application of refrigeration		
9.3	Vapour compression refrigeration system,		
9.4	Window and split air conditioning systems		

Part: C

10.	**Scope of Civil Engineering**	**02 Hours**	**4 %**
10.1	Scope of Civil Engineering,		
10.2	Branches of civil engineering,		
10.3	Role of civil engineer		
11.	**Introduction to Surveying**	**04 Hours**	**9 %**
11.1	Definition of surveying,		
11.2	Objects of surveying, Uses of surveying,		
11.3	Primary divisions of surveying, Principles of surveying,		
11.4	List of classification of surveying, Definition: Plan and Map, Scales : Plain scale and Diagonal scale, Conventional Symbols		
11.5	Introduction to linear and angular measurements, Concepts of land profiling		
12.	**Elements of building Construction**	**05 Hours**	**11 %**
12.1	Types of building, Design loads,		

12.2 Building components (super structure and substructure),

12.3 Principles of Planning,

12.4 Basics Requirements of a building Planning,

12.5 Types of Residential Building,

D Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

E Student Learning Outcomes:

On the completion of the course, one should be able to:

CO1	Describe the fundamentals of engineering drawing, engineering scale and engineering curve.
CO2	Interpret and describe the drawing of projection & section of solid.
CO3	Visualize and draw three-dimensional of engineering components through orthographic, sectional orthographic and isometric drawing and use the computer for geometric modelling.
CO4	Explain and write fundamental principles of mechanical engineering and different mechanical system.
CO5	Explain the importance of civil engineering and land surveying.
CO6	Interpret and describe the different building components, building planning and design of residential building.

Course Articulation Matrix

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-

CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	1	2	-	-	-	-	-	-	-	-	-	-	-	-

F Recommended Study Material:

Text Books:

1. N. D. Bhatt & V. M. Panchal, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. P. J. Shah, "Engineering Graphics", S. Chand Publishing & Co.
3. P.S.Desai, S.B.Soni, "Elements of Mechanical Engineering", Atul Prakashan, Ahmedabad
4. S.M.Bhatt, H.G.Katariya, J.P.Hadiya, "Elements of Mechanical Engineering", Books India Publication, Ahmedabad.
5. Khasia R.B. and Shukla R.N., "Elements of Civil Engineering", Mahajan Publication.
6. Punamia B.C., "Surveying", Vol. I & II.

Reference Books:

1. P.B. Patel & P.D. Patel, "Engineering Graphics", Mahajan Publishing House.
2. Arunoday Kumar, "Engineering Graphics", Tech-Max Publication.
3. M.L. Agrawal & R.K. Garg, "Engineering Drawing", Vol. I, Dhanpatrai & Co.
4. Dr. Sadhu Singh, "Elements of Mechanical Engineering", S.CHAND Publication, New Delhi
5. V.K.Manglik, "Elements of Mechanical Engineering", PHI Learning, Delhi.
6. Kandya Anurag, "Elements of Civil Engineering", Charotar Publishing House Pvt. Ltd.
7. Kanetkar T.P. & Kulkarni S.V., "Surveying and Levelling", Vol. I & II.

Reading Materials, web materials with full citations:

1. http://nptel.ac.in/courses/112103019/
2. http://nptel.ac.in/downloads/112105125/
3. http://nptel.ac.in/syllabus/syllabus.php?subjectId=105104101
4. http://nptel.ac.in/courses/105107122/
5. https://law.resource.org/pub/in/bis/S01/is.sp.46.2003.pdf

FACULTY OF APPLIED SCIENCES
DEPARTMENT OF PHYSICS
PY143: ENGINEERING PHYSICS - II

A. Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	-	2	-	2	2
Marks	-	50 (Internal) + 50 (External) =100	-	100	

B. Objective of the Course:

This is a basic physics lab covering the fundamental laws and phenomena in electromagnetism, light and optics and modern Physics. Following are the specific objectives of the course.

1. The course will help in reinforcing the concepts of physics through conceptual and experiential learning.
2. Develop experimental and analytical skills for both theoretical problems and data
3. Understand the role of direct observation as the basis for knowledge in physics
4. Appreciate scientific inquiry into exploring creatively how the world works
5. Develop collaborative learning skills through cooperative work

C. Outline of the Course:

Unit No.	Title of the Unit	Minimum number of Hours
Unit 1	Electricity and magnetism Lab	12
Unit 2	Light and Optics Lab	8
Unit 3	Modern Physics Lab	10
		Total Hours:30

D. Detailed Syllabus:

1	**Electricity and magnetism:** **1.1** Charge, Conductors and Insulators, Coulomb's law, The electric field **1.2** Principle of Superposition, Electric potential energy, Electric potential **1.3** Capacitance and capacitors, The electric potential inside a parallel plate capacitor, electron current, **1.4** Conductivity and resistivity, resistance and Ohm's law, Kirchhoff's laws and basic circuit, energy and power	**12 hours**

	1.5 Magnetic field, The magnetic field of a current, magnetic dipoles **1.6** Ampere's law and solenoids, Magnetic forces on current-carrying wires **1.7** Magnetic properties of matter, Induced currents, Lenz's law, Faraday's law, **1.8** Induced currents: Three Applications, Inductors, LC Circuits, LR Circuits, LRC Circuits	
	No. of Experiment 1. Measurement of capacitance by the bridge method 2. Induction and LR, LC, and LRC Circuits 3. Magnetic field along the axis of a coil 4. Time Constant of RC Circuit 5. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)	
2	**Wave and Optics:** **2.1** Classification of waves: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves, Pressure of a Longitudinal Wave. Energy Transport **2.2** Intensity of Wave, Standing (Stationary) Waves in a String: Fixed and Free Ends, Longitudinal Standing Waves and Normal Modes, Superposition of Waves, Propagation of electromagnetic waves **2.3** Diffraction and Interference, reflection, refraction, refractive index, **2.4** Basics of LASER Physics, Total Internal reflection, Basics of optical fiber, Acceptance angle and Numerical aperture	**08 hours**
	No. of Experiment 1. The wavelength of light, LASER, and Diffraction 2. Numerical Aperture and Bending Losses in Optical fiber 3. Standing (Transverse) Waves and resonance Using Vibrating Strings. Melde's Experiment	
3	**Modern Physics:** **3.1** Planck's quantum theory, Planck's constant and light as a collection of photons **3.2** Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves **3.3** Davisson- Germer experiment, Wave-particle duality, Heisenberg uncertainty principle-impossibility of a particle following a trajectory **3.4** Two slit interference experiment with photons, atoms and particles; Radioactivity: stability of nucleus; Law of radioactive decay	**10 hours**
	No. of Experiment 1. The Photoelectric Effect; photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light 2. Frank hertz experiment; To determine the ionization potential of mercury 3. To determine value of Planck's constant using LEDs of at least 4 different colours	

E. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Section wise Online Quiz will be taken.
- Lab manual: Student will be required to read the lab material prior to the start of class. A way to ensure this is by lab quizzes and assignments.
- Lab Reports: Student has to write lab reports and submit them hardcopy/electronically. The purpose of this exercise is both to demonstrate your work in lab and to guide you to think a bit more deeply about what you are doing. The act of technical writing also helps improve your communication skills, which are broadly relevant far beyond the physics lab

F. Student Learning Outcome:

CO1	Students would be able to describe the static and dynamic electric and magnetic fields for technologically important structures.
CO2	Ability to identify and illustrate physical concepts and terminology used in optics and other wave phenomena.
CO3	Students would be able to appreciate the need for quantum mechanics, wave particle duality, uncertainty principle etc. and their applications.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	1	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PY143	3.00	3.00	2.00	1.67	1.00	-	-	-	-	-	-	-	-	-	-

G. Recommended Study Material:

❖ **Text Books:**

1. Physics for Scientists and Engineers by Randall D. Knight, 4th Edition, Pearson
2. University Physics by Hugh D. Young, Roger A. Freedman and A. Lewis Ford, 13th Edition, Pearson

3. Physics by John D. Cutnell& Kenneth W. Johnson, 8th Edition, John Wiley & Sons, Inc.

❖ **Reference Books:**

1. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
2. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
3. Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
4. Principles of Optics, Max Born and Emil Wolf, 7th Edn. 1999, Pergamon Press.
5. Optics, AjoyGhatak, 2008, Tata McGraw Hill
6. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
7. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
8. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.

❖ **Web Materials:**

1. Measurement of capacitance by the bridge method - https://www.youtube.com/watch?v=loZC-2A3LLg
2. Phasor Diagram of RL, RC and RLC Circuits - https://www.youtube.com/watch?v=HaFrY0qQ-NU
3. Magnetic field along the axis of a coil - https://www.youtube.com/watch?v=S0N4eVg7I3Y
4. Quinck`s Tube Method - https://www.youtube.com/watch?v=yzgdq8uUfO4
5. The wavelength of light, LASER - https://www.youtube.com/watch?v=desLn3tMLcc
6. Numerical Aperture and Bending Losses in Optical fiber - https://www.youtube.com/watch?v=b7dLcINlvwE, https://www.youtube.com/watch?v=Wh9knsYSodI
7. Melde's Experiment - https://www.youtube.com/watch?v=pvX5y95Sye0, https://www.youtube.com/watch?v=1CyFsGk-_l4
8. The Photoelectric Effect - https://www.youtube.com/watch?v=6VqNz4oT0ng, https://www.youtube.com/watch?v=kcSYV8bJox8
9. Frank hertz experiment - https://www.youtube.com/watch?v=aFLnOglBxDk
10. To determine value of Planck's constant using LEDs - https://www.youtube.com/watch?v=fmbSTt8dDWs

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF TECHNOLOGY AND ENGINEERING
M. S. PATEL DEPARTMENT CIVIL ENGINEERING
CL144.02A ENVIRONMENTAL SCIENCES

A. CREDIT AND SCHEME:

Teaching Scheme	Theory	Practical	Total	Credit	Evaluation Scheme				
					Theory		Practical		Total
Hours/week	0	2	2	2	Internal	External	Internal	External	
Marks	0	100	100		--	--	30	70	100

B. OUTLINE OF THE COURSE:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Multidisciplinary nature of environmental Sciences	03
2	Environmental Pollution	07
3	Ecology & Ecosystems	05
4	Biodiversity and Conservation	04
5	Natural Resources	04
6	Human Communities and the Environment	07

Total Hours (Theory): 00

Total Hours (Lab): 30

Total Hours: 30

C. DETAILED SYLLABUS:

1.	**Multidisciplinary nature of environmental studies** a) Definition, scope and importance b) Earths-Evolution and Systems c) Components of the Environment: Biotic, Abiotic, Atmosphere, Lithosphere, Hydrosphere, Biosphere d) Concept of sustainable development	**03 hrs.**	**10%**
2.	**Environmental Pollution** a) Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution b) Nuclear hazards and human health risks c) Solid waste management: Control measures of urban and industrial waste	**07 hrs.**	**23%**

	d) Pollution case studies – Ganga/Yamuna River, Bhopal Gas Tragedy, Delhi Air Pollution, Effect of Pandemics on the Environment		
3.	**Ecology & Ecosystems** a) Concept of an ecosystem, Structure and function of an ecosystem b) Producers, consumers and decomposers c) Energy flow in the ecosystem, Food chains, food webs and ecological pyramids d) Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers)	**05 hrs.**	**17%**
4.	**Biodiversity and Conservation** a) Introduction – Definition: genetic, species and ecosystem diversity b) Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values c) Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. d) Endangered and endemic species of India, Conservation of biodiversity e) Biodiversity Act 2002/ BD Rule 2004: Mandate & Functions of National Biodiversity Authority (NBA), Role of State Biodiversity Board (SBB) and Biodiversity Management Committees(BMC).	**04 hrs.**	**13%**
5.	**Natural Resources** a) Renewable and non-renewable resources b) Recyclable and Non-recyclable resources c) Energy resources: Growing energy needs, use of alternate energy sources. Case studies. d) Role of an individual in conservation of natural resources	**04 hrs.**	**13%**
6.	**Human Communities and the Environment** a) Pandemics: Causes, Effects, Impact on the Environment: Positive & Negative, Lessons to learn b) Floods, Cyclones, Earthquakes, Landslides & Forest Fires c) Human population growth: Impacts on environment, human health and welfare. d) Case Studies: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, etc.	**07 hrs.**	**23%**

D. INSTRUCTIONAL METHOD AND PEDAGOGY:

The course is based on practical learning. Teaching will be facilitated by Slides Presentations, Reading Material, Discussions, Case Studies, Ted Talks, Videos, Task-Based Learning, Projects, Assignments and various Individual and Interpersonal activities like, Critical reading, Group work, Independent and Collaborative Research, Presentations, etc.

E. EVALUATION:

There will be end semester university examinations based on Practical/ Viva. Students will be evaluated continuously in the form of internal as well as external evaluation. The evaluation is schemed as 30 marks for internal evaluation and 70 marks for external evaluation. The concerned teacher shall evaluate students and distribute the marks (out of 30 as Internal and 40 out of 70 as External). Rest 30 marks (30 out of 70 of external) will be given based on the performance in the Practical/Viva) examination.

Evaluation Scheme

The students' performance in the course will be evaluated through the following components:

Component		Marks
Internal	Attendance	05
	Assignment/ Individual Activity Participation/ Quiz, etc.	25
External	Group Activity Participation, Project Report, Case Study with Report, Online Certification Course, MOOCS, Field Work with report, Presentation etc.	40
	Viva/ Oral Examination	30
	Total	**100**

F. LEARNING OUTCOMES:

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

CO1	To perceive the elementary knowledge about natural environment and its relation with science.
CO2	To identify and analyze human impacts on the environment.
CO3	To understand the facts and concepts of natural and energy resources thereby applying them to lessen the environmental degradation.
CO4	To Initiate new and innovative environmental friendly practices.
CO5	To communicate on recent environmental problems thereby creating awareness among society.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	3	-	-	-	-	-	-	3
CO3	-	-	-	-	-	2	3	-	-	-	-	-	-	3
CO4	-	-	2	-	-	-	3	-	-	-	-	-	2	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

G. RECOMMENDED STUDY MATERIAL:

Text Books:

1. Varandani, N.S., Basics of Environmental Studies
2. Sharma, J. P., Basics of Environmental Studies

Reference Books:

1. Shah Shefali & Goyal Rupali, Basics of Environmental Studies
2. Agrawal, K.C., Environmental Pollution : Causes, Effects & Control
3. Dameja, S. K., Environmental Engineering & Management
4. Rajagopalan, R., Environmental Studies, Oxford University Press
5. Wright Richard T. & Nebel Bernard J., Environmental Science
6. Shah, S.G., Shah, S.G. & Shah, G. N., Basics of Environmental Studies, Superior Publications, Vadodara

Web Materials:

- http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT Delhi/Environmental%20Air%20Pollution/index.htm
- http://nptel.iitm.ac.in/video.php?subjectId=105104099
- http://apollo.lsc.vsc.edu/classes/met130/notes/chapter1/vert_temp_all.html
- http://www.epa.gov
- http://www.globalwarming.org.in
- http://nopr.niscair.res.in
- http://www.indiaenvironmentportal.org.in
- http://nbaindia.org/

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 3)

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY
FACULTY OF SCIENCES
MATHEMATICAL SCIENCES
MA253: DISCRETE MATHEMATICS AND ALGEBRA

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	-	4	4
Marks	100	-	100	

A. Objective of the Course:

Discrete Mathematics and Algebra have many applications in Computers Engineering and Information Technology. This course contains many concepts which are applicable to subjects like Theory of Computation, Artificial Intelligence, Data Structure and Algorithms, Compiler Constructions, Algorithm Analysis and Design, Digital Electronics etc.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Predicate Calculus	08
2.	Relations and Lattice	10
3.	Graph Theory	12
4.	Recurrence Relations	05
5.	Abstract Algebra	09
6.	Linear Algebra	16
	Total Hours	60

C. Detailed Syllabus:

1.	**Predicate Calculus:**	08 Hours	13 %
	1.1 Revision: Propositions, connectives, converse, inverse, contrapositive, tautology, contradiction.		
	1.2 Logical equivalence.		
	1.3 Minimal functionally complete set of connectives.		
	1.4 Principle conjunctive normal forms and Principle disjunctive normal forms.		
	1.5 Predicate calculus using rules of inferences.		
2.	**Relations and Lattice:**	10 Hours	17%
	2.1 Revision of properties of relations on sets.		
	2.3 Representations of relations: graphical and matrix representation.		
	2.4 Equivalence relation, covering of a set, partition of a set.		
	2.5 Partially ordered sets, totally ordered sets, Hasse diagram.		
	2.6 Lattices, sub lattices.		
	2.7 Properties of lattices (without proof).		
	2.8 Complete lattices, bounded lattices, distributive lattices, complemented lattices and complemented distributive lattices.		
3.	**Graph Theory:**	12 Hours	20%
	3.1 Basic terminologies, Simple graph, Types of graphs.		
	3.2 Degree of a vertex, matrix representations of graph.		
	3.3 Path and connectivity.		
	3.4 Eulerian and Hamiltonian graph.		
	3.5 Subgraphs, spanning subgraphs, isomorphic graphs.		
	3.6 Planar graphs.		
	3.7 Matching in graphs.		
	3.8 Graph coloring.		
4.	**Recurrence Relations:**	05 Hours	08%
	4.1 Solutions of recurrence relation by direct methods.		
	4.2 Generating functions and solutions of recurrence relation.		
5.	**Abstract Algebra:**	09 Hours	15%
	5.1 Groupoid, semi group, monoid, group.		
	5.2 Order of a group, order of an element, Lagrange's theorem.		
	5.3 Subgroup, cyclic subgroup, permutation group.		
6.	**Linear Algebra:**	16 Hours	27%
	6.1 Vector space: definition and examples. Subspaces.		
	6.2 Linear combinations, linearly dependence and linearly independence.		
	6.3 Basis and dimension of a vector space.		
	6.4 Linear transformations. Null space and range of a linear transformation. Rank - nullity theorem. Isomorphisms.		

D. Instructional Method and Pedagogy:

- At the starting of the course, the course delivery pattern, prerequisite of the subject must be discussed.

- Lectures may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal tests/ unit tests must be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Two Quizzes (surprise tests)/ oral test / viva will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

At the end of the course the students would be able to

CO1	Develop logical argument using truth table and rules of inferences in predicate calculus.
CO2	Relation and types of relations define on sets and utilize it to construct Hasse diagram and lattices on sets.
CO3	Graph and types of the graphs and identify the real world phenomena in terms of graph theory.
CO4	The concept of recurrence, generating functions and their applications in solving recurrence relations.
CO5	Different algebraic structures like groupoid, semi group, monoid, group , cyclic group and permutation group
CO6	Definition of vector space, concepts of the terms: linear span, linear independence, basis, dimension. Definition and properties of linear transformations, range and kernel of a linear transformation.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	1	-	2	-	-	-	-	-	-	-	3	1
CO4	3	-	-	-	1	-	-	-	-	-	-	-	3	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-	2	-
CO6	2	1	-	1	-	-	-	-	-	-	-	-	2	-

Correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

F. Recommended Study Material:

❖ **Text Books:**

1. Rosen, Kenneth H. and Kamala Krithivasan; Discrete mathematics and its applications. Vol. 6. New York: McGraw-Hill, 1995.
2. Swapan Kumar Sarkar; A Text Book of Discrete Mathematics, S. Chand and Co. New Delhi 2008.

3. H. Anton and C. Rorres; Elementary Linear Algebra, Application version, Wiley Edition 2010.

❖ **Reference Books:**

1. Jean-Paul Tremblay and Rampurkar Manohar; Discrete mathematical structures with applications to computer science. New York: McGraw-Hill, 1975.
2. D. F. McAllister and D. F. Stanat; Discrete Mathematics in Computer Science. Prentice-Hall, Inc.1977.
3. Narsingh Deo; Graph theory with applications to engineering and computer science. Courier Dover Publications, 2016.
4. B. Kolman and R. C. Busby; Discrete Mathematical Structures for Computer Science, 2nd edition, Prentice-Hall, Englewood Cliffs, New Jersey 1987.
5. D. S. Malik and Mridul K. Sen; Discrete mathematical structures: theory and applications. Course Technology, 2004.
6. H. Cormen Thomas, C. E. Leiserson, R. L. Rivest and C. Stein.; Introduction to algorithms (Vol. 6). Cambridge: MIT press,2001.

❖ **URL Links:**

Lecture Notes:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf
2. http://home.iitk.ac.in/~arlal/book/mth202.pdf
3. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
4. https://www.cs.cornell.edu/~rafael/discmath.pdf
5. http://www-sop.inria.fr/members/Frederic.Havet/Cours/matching.pdf
6. http://www-sop.inria.fr/members/Frederic.Havet/Cours/coloration.pdf

Video Lectures:

7. http://www.nptelvideos.in/2012/11/discrete-mathematical-structures.html
8. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010/video-lectures/

IT250: DIGITAL ELECTRONICS

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objectives of the Course:

- To understand number representation and conversion between different representations in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits and simplification of boolean expressions.
- To understand the characteristics of memory and their classification.
- To understand concepts of combinational and sequential circuits and to analyze sequential systems in terms of state machines.
- To understand the concept of Programmable Devices, PLA, PAL and HDL.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Number Systems	04
2.	Boolean Algebra and Logic Gates	04
3.	Simplification of Boolean Functions	06
4.	Combinational Logic	06
5.	Combinational Logic With MSI AND LSI	07
6.	Sequential Logic	07
7.	Registers, Counters and the Memory Unit	07
8.	Introduction to Verilog	04

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Number Systems** Digital Computer and Digital Systems, Binary Number, Number Base, Conversion Octal And Hexadecimal Number, Complements, Binary Codes, Binary Storage And Register, Binary Logic, Integrated Circuit	**04Hrs**	**9%**
2.	**Boolean Algebra And Logic Gates** Basic Definition, Axiomatic Definition of Boolean Algebra, Minterm And Maxterms, Basic Theorem And Properties of Boolean Algebra, Logic Operations, IC Digital Logic Families, Propagation delay, Fan in, Fan out	**04Hrs**	**9%**
3.	**Simplification of Boolean Functions** Two-Three Variable K-Map, Four- Five Variable K-Map, Product of Sum Simplification, NAND or NOR Implementation, Don't Care Condition, Tabulation Method	**06Hrs**	**13%**
4.	**Combinational Logic** Introduction, Design Procedure, Hazards, Adder, Sub tractor, Code Conversion, Universal Gate, Exclusive OR & Equivalence Functions	**06Hrs**	**13%**
5.	**Combinational Logic With MSI And LSI** Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoder, Multiplexer, ROM, PLA, PAL	**07Hrs**	**16%**
6.	**Sequential Logic** Introduction, RS,JK,D,T Flip-Flops, Triggering of Flip-Flops, Flip-Flop Excitation Tables, Analysis of Clocked Sequential Circuits, State Reduction And Assignment Design Procedure, Design of Counters, Design With State Equations	**07Hrs**	**16%**
7.	**Registers, Counters And The Memory Unit** Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, Memory Unit, Johnson Counter	**07Hrs**	**16%**
8.	**Introduction to Verilog** Overview of Digital Design with Verilog HDL, Basic operations, Design of Fundamental digital blocks using various modeling styles.	**04Hrs**	**8%**

D. Student Learning Outcome:

After completion of the course, students will able to

CO 1	Describe the basic building blocks of various digital circuits.

CO 2	Design combinational logic and sequential logic circuits using basic components and using HDL as well.
CO 3	Identify and examine the structure of various number systems and it's a application in digital components in computer organization.
CO 4	Analyze a memory cell and apply for organizing larger memories and also apply for designing MSI, LSI and VLSI circuits.

Course Articulation Matrix:

	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PO 11**	**PO 12**	**PSO 01**	**PSO 02**
CO 1	1	-	-	-	-	-	1	-	-	-	-	3	-	2
CO 2	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	2	-	-	-	-	-	-	-	2	-	2	1	-
CO 4	-	-	2	-	1	1	-	-	2	-	-	-	-	2

E. Recommended Study Material:

❖ **Reference Books:**

1. M. Morris R. Mano (5th Edition) PEARSON Pub, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog.
2. Malvino & Leach, THI-1999, Digital Principles and Application.
3. A. Anandkumar, Fundamental of Digital Electronics.
4. R.P.Jain, Modern Digital Electronics.

❖ **Web Materials:**

1. http://nptel.ac.in/courses/117106086/1
2. http://uotechnology.edu.iq/appsciences/Laser/Lacture_laser/four_class/digital_electronics/digital_electronics.pdf
3. http://www.32x8.com/
4. http://nptel.ac.in/courses/106105083/

IT251: JAVA PROGRAMMING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	4	0	7	5
Marks	100	100	**0**	200	

A. Objective of the Course:

Course objectives: The course is intended to make the students

- Understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of object-oriented software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamental of Object-Oriented Programming	3
2.	Class Fundamentals	4
3.	Array & String Handling	4
4.	Inheritance, Interfaces & Packages	5
5.	Exceptions Handling	5
6.	Multithreaded Programming	8
7.	GUI Programming & Lambdas and Streams	7
8.	File I/O and NIO	5
9.	Java Collection Frameworks and Generics	4
	Total hours (Theory):	**45**
	Total hours (Lab):	**60**
	Total hours:	**105**

C. Detailed Syllabus:

1.	**Fundamental of Object-Oriented Programming** History of Java, Basic overview of java, Bytecode, JVM, Buzz-words, Application and applets, Constants, Variables & Data Types, Comments, Operators, Control Flow	**03 Hours**	**04 %**
2.	**Class Fundamentals** General form of class, Creating class Overloading methods, Constructor, Declaring Object, Returning objects, using objects as parameters, Assigning object reference variables, Introducing Access control, Understanding static, Introducing final, The finalize() method, The this keyword, Garbage collection	**04 Hours**	**09 %**
3.	**Array & String Handling** Array basics, String Array, String class, StringBuffer class, String Tokenizer Class and Object Class	**04 Hours**	**04 %**
4.	**Inheritance, Interfaces & Packages** Inheritance: Using super creating multilevel Hierarchy, method overriding, Dynamic method dispatch, abstract classes, using final with Inheritance, Using Package: Defining package, finding package and CLASSPATH, Access protection, importing package, Interface: Defining Interface, Implementing Interface, Variables in Interface	**05 Hours**	**13 %**
5.	**Exceptions Handling** Exception types, Try ...Catch...Finally, Throw, Throws, creating your own exception subclasses	**05 Hours**	**11 %**
6.	**Multithreaded Programming** Life cycle of thread, thread methods, thread priority, thread exceptions, Implementing Runnable interface, Synchronization	**08 Hours**	**16 %**
7.	**GUI Programming & Lambdas and Streams** Introduction to Annotation, Byte streams and character streams, Wrapper classes , Why Lambda Expression, Lambda Expression Syntax, Where to use lambda expression, Adopting Patterns like matching, finding and filtering, Swing overview ,Swing component classes: AbstractButton, ButtonGroup, ImageIcon, JApplet,Jbutton,	**07 Hours**	**16 %**

JcheckBox, JcomboBox, Jlabel, JradioButton, JscrollPane, JtabbedPane, Jtable, JtextField, Jtree

8.	**Java I/O** File and Directories, Byte streams and character streams, Random Access Files	**05 Hours**	**13 %**
9.	**Java Collection Frameworks and Generics** Collections of objects, Collections: Sets, Sequence, Map, Understanding Hashing, Use of Array List & Vector, Generics Class, Optional Classes, Processing data with streams	**04 Hours**	**14 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weight.
- Assignments/ Surprise tests/Quizzes/Seminar based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After learning the course, students will able to

CO1	Implement Object Oriented programming concept using basic syntaxes of control Structures, strings, and function for developing skills of logic building activity.
CO2	Use of a variety of basic control structures including selection and repetition; classes and objects in a tiered architecture (user interface, controller, and application logic layers)
CO3	Demonstrates how to achieve reusability using inheritance, interfaces, and packages and describes faster application development that can be achieved.
CO4	Demonstrate understanding and use of different exception handling mechanisms and concepts of multithreading for robust faster and efficient application development.
CO5	Identify and describe common abstract user interface components to design GUI in Java using Swing along with a response to events.

CO6	Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	1	1	-	-	-	-	-	-	1	3
CO3	-	2	2	3	2	-	-	-	-	-	1	1	-	-
CO4	1	1	1	1	3	-	-	-	-	-	2	2	3	-
CO5	1	1	2	3	3	-	-	1	-	-	1	1	2	2
CO6	1	1	1	2	3	1	-	1	-	-	2	1	3	3

F. Recommended Study Material:

- Text Books:
  1. Java: The Complete Reference, Eleventh Edition by Herbert Schildt, Oracle Press
- Reference Books:
  1. Java: A Beginner's Guide, Eighth Edition 8th Edition by Herbert Schildt, Oracle Press
  2. Head First Java: A Brain-Friendly Guide 2nd Edition by Kathy Sierra, Bert Bates, O'Reilly
  3. OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide: Exam 1Z0-815 1st Edition by Jeanne Boyarsky, Scott Selikoff
- Web Materials:
  1. https://docs.oracle.com/javase/tutorial/tutorialLearningPaths.html
  2. http://openjdk.java.net/projects/jigsaw/
  3. https://docs.oracle.com/en/java/javase/14/docs/api/index.html
- Software
  1. https://www.oracle.com/java/technologies/javase-downloads.html
  2. https://netbeans.apache.org/download/index.html
  3. https://download.eclipse.org/eclipse/downloads/

IT252: DATA COMMUNICATION & NETWORKING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

This course will allow students to develop background knowledge as well as core expertise in data communications and networking, which is one of the fastest growing technologies.

The main objective to give the course is

- To make them familiar with basic need of communication and networking.
- To familiarize students with the concepts of circuits, signals, multiplexing, etc.
- To identify different types of network topology.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction	04
2.	Network Models	07
3.	Switching	04
4.	Networking and Internetworking Devices	03
5.	Error Detection and Correction	05
6.	Signals	05
7.	Signal Encoding Techniques	05
8.	Communication Channel Characteristics	03
9.	Bandwidth Utilization: Multiplexing and Spectrum Spreading	05
10.	Transmission Media	04

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	Introduction Data Communications, Networks, Network Types, Standards And Administration	04 Hours	06%
2.	Network Models Protocol Layering, TCP/IP Protocol Suit, The OSI Model	07 Hours	17%
3.	Switching Introduction, Circuit-Switched Networks, Packet Switching, Structure of a Switch	04 Hours	08%
4.	Networking and Internetworking Devices Repeaters, Hub, Bridges , Switches, Routers, Gateways, Brouters, Routing Algorithms, Distance Vector Routine, Link State Routing	03 Hours	05%
5.	Error Detection and Correction Types of Errors, Detection, Parity Check, Vertical Redundancy Check ,Cyclic Redundancy Check, Error Correction	05 hours	08%
6.	Signals Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission Impairments, Data rate limits, Performance	05 Hours	12%
7.	Signal Encoding Techniques Digital Transmission: Digital to Digital Conversion, Analog to Digital Conversion, Transmission modes Analog Transmission: Digital to Analog Conversion, Analog to Analog Conversion	05 Hours	13%
.	Communication Channel Characteristics Electromagnetic waves, Frequency and Wavelength, Bandwidth and Channel Capacity, Bandwidth and Distance	03 Hours	07%
9.	Bandwidth Utilization: Multiplexing and Spectrum Spreading Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing	05 Hours	14%

	Spread Spectrum: Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum		
10.	Transmission Media Guided Media: Twisted - Pair Cable, Coaxial Cable, Fiber - Optic Cable, Unguided media: Radio Waves, Microwave and Infrared	04 Hours	10%

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weight.
- Assignments/ Surprise tests/Quizzes/Seminar based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

Course Outcome (COs):

After learning the course, students will able to

CO1	Understand, analyze and apply the concept of Data Communication and networks, layered architecture and their applications.
CO2	Evaluate data communication links considering elementary concepts of data link layer protocols for error detection and correction and explain different switching techniques.
CO3	Understand, analyze and select appropriate signal encoding techniques and multiplexing techniques for real scenarios.
CO4	Compare and select transmission media based on transmission impairments and channel capacity.

Course Articulation Matrix:

	PO1	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	-	-	-	2	3
CO2	-	1	-	2	-	-	-	-	-	-	-	-	1	-
CO3	1	3	3	2	-	-	2	-	-	-	-	-	3	2
CO4	2	2	-	-	-	-	1	-	-	-	-	-	-	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

Recommended Study Material:

- **Text book:**
  1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGraw Hill Publication
  2. TCP/IP Protocol suite, 4th Edition, Behrouz A. Forouzan, McGraw Hill Publication
- **Reference book:**
  1. Electronic Communications, Kennedy McGraw Hill Publication.
  2. Data Communication By William Schweber, McGraw Hill Publication
- **Web material:**
  1. https://nptel.ac.in/courses/106105082/
  2. https://nptel.ac.in/courses/106105183/
  3. https://nptel.ac.in/courses/117105076/
  4. https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_overview.htm
  5. https://nptel.ac.in/content/storage2/courses/106105080/pdf/M2L7.pdf
  6. Cisco.netacad.net
- **Software:**

1. Cisco Packet Tracer.

IT253: SOFTWARE GROUP PROJECT-I

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	0	**2**	0	2	**1**
Marks	**0**	50	**0**	**50**	

A. Objective of the Course:

The main objectives for offering the course are:

- To increase awareness and enhance knowledge of students in developing software projects compatible with industry standard, technology and latest development in field of Computer and IT.
- To provide exposure in the field of Software development and apply various tools in software development life cycle.
- To provide additional technical skill useful for the project work.
- To develop and test one's ability to learn independently, continually and interact with multidisciplinary groups.
- To provide a deep understanding of various domains of software projects and ability to solve practical/utility problems.

B. Outline of the Course:

- Students at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.

- Students have to submit project with following listed documents at the time of final submission.
    a Project Synopsis
    b. Software Requirement Specification
    c. SPMP
    d. Final Project Report/paper
    e. Project Setup file with Source code [Uploaded on GitHub]
    f. Project Presentation (PPT)
    g. Video Recording (Per Project)
- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 30

Total hours: 30

C. Instructional Method and Pedagogy:

- Project Groups would be form of maximum two students.
- Inter batch group formation is not permitted due to difficulties in progress tracking.
- Students are advised to choose innovative and challenging definitions.
- Batch wise project definitions must be unique.
- Any kind of management system would not be encouraged.
- Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
- Student has to prepare Report/Paper at end of semester as part of submission.
- Report/Paper structure is finalized for semester end submission.
- To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for internal reviews, which will help them to get more insight in the project.
- To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check before 15 days of external exam.

- Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
- Students have to bring internal review card hard copy on the day of internal review exam, after that they will bring filled review card on the day of external review.

D. Student Learning Outcome:

After learning the course, students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.
CO5	Solve communication issues in large, complex software projects and Structure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Reference book:**

1. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
2. Sanjay Mohapatra, Software Project Management, Cengage Learning
3. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, "Engineering Design – A Project Based Introduction", Wiley India Pvt. Ltd.
4. B. Hughes & M. Cotterell, "Software Project Management", Tata Mcgraw Hills.

❖ **Web Materials:**

1. https://status.net/templates/project-report/
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
3. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
4. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
5. https://nptel.ac.in/courses/106/105/106105218/
6. https://www.youtube.com/watch?v=T3q6QcCQZQg
7. https://www.scribbr.com/category/research-paper/

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 4)

CHAROTARUNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY
FACULTY OF SCIENCE
MATHEMATICAL SCIENCES
MA261: STATISTICAL AND NUMERICAL TECHNIQUES

Credits and Hours:

Teaching Scheme	Theory	Tutorial	Total	Credit
Hours/week	4	0	4	4
Marks	100	0	100	

B. Objective of the Course:

This course is a foundation course for other courses of higher semester courses of B. Tech. (IT) viz. (i) Data warehousing and data-mining (ii) Artificial Intelligence (iii) Image Processing (iv) Machine Learning and related courses.
The objectives of the course are:

1. To develop motivation towards statistical and numerical techniques,
2. To understand the concepts of probability and its applications, computing probabilities of various random events and statistical hypothesis tests,
3. To understand concept of simulation.
4. To understand the concept of interpolation and curve fitting.
5. To develop skill to solve problems pertaining to Numerical integrations, numerical solutions of equations like f(x) = 0, numerical solution of simultaneous linear equations and numerical solutions of differential equations.

C. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Sampling Distributions and Test of Hypotheses	12
2.	Simulation	12
3.	Simple Regression and Simple Correlation	06
4.	Interpolation and Curve Fitting	15
5.	Numerical Integration, Solution of Different Types of Equations.	15
	Total hours	60

D. Detailed Syllabus:

1. Sampling Distributions and Test of Hypotheses: 12Hours 20%

1.1 Population and sample, function of random variables associated with normal distribution,Central limit theorem.

1.2 Random sampling, Sample moments and their distributions: Chi-square, t and F distributions.

1.3 Point estimation and interval estimation:Estimation of population mean, population variance, population proportion, one population and two populations.

1.4 Introduction to hypothesis Testing, z- test, t-test, chi-square test and F-test, one sample and two samples tests.

2. Simulation: 12Hours 20%

2.1 Introduction to random numbers.

2.2 Generating random numbers from probability distributions: Binomial,Poisson, Uniform, Exponential and Normal.

2.3 Variance reduction techniques.

2.4 Markov Chain, Monte Carlo Method and its applications.

3. Simple Regression and Simple Correlation: 06Hours 10%

3.1 Measure of association between two variables. Types of correlation, Karl Pearson's Coefficient of correlation and its mathematical properties.

3.2 Spearman's Rank correlation and its interpretations.

3.3 Regression Analysis: Concept and difference between correlation and regression, linear regression equations, properties of regression coefficients.

4. Interpolation and Curve fitting: 15Hours 25%

4.1 Errors in numerical analysis: types of errors, sources of errors.

4.2 Interpolation, Lagrange's interpolation formula.Newton's divided difference table and Newton's Interpolation polynomial.

4.3 Finite differences and associated operators.

4.4 Newton's forward interpolation formula, Newton's backward interpolation formula.

4.5 Least squares curve fitting methods, linear and quadratic curve fitting.

5. Numerical Integration and Numerical Solution of Different Types of Equations: 15Hours 25%

5.1 Numerical Integration: Rectangle rule, trapezoidal rule and Simpson's rules (1/3 and 3/8) andtheir composite rules.

5.2 Numerical solution of equations: Bisection method, False position (Regula-Falsi) and Newton-Raphson method.

5.3 Numerical solution of system of simultaneous linear equations: Gauss Jacobi Method and Gauss Seidel Method.

5.4 Numerical Solution of Ordinary Differential Equations: Taylor's series, Euler's, and Runge- Kutta (2^{nd} and 4^{th} order) methods.

D. Instructional Method and Pedagogy:

- At the starting of the course, the course delivery pattern, prerequisite of the subject must be discussed.
- Lectures may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures which carries a 5% component of the overall evaluation.
- Minimum two internal tests/unit testsmust be conducted and average of two will be considered as a part of 15% overall evaluation.
- Quizzes (surprise tests) /Oral tests/ Viva/Assignments will be conducted which carries 10% component of the overall evaluation.

E. Student Learning Outcomes:

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

CO1.	• Differentiate between population and sample distribution. Parameter and Statistic • Calculate confidence interval for parameter • Formulate null and alternate hypothesis • Solve the test of hypothesis problems
CO2.	• Relate the real system with virtual system • Construct simulation algorithm to generate random numbers • Verify the stated results of variance reduction
CO3.	• Identify the nature of relationship between two variables • Describe the scatter diagrams • Calculate correlation coefficient, regression coefficients
CO4.	• Examine the types of error in numerical computations • Differentiate the interpolation techniques and curve fitting techniques • Create the divided difference table • Solve the problems of interpolation • Solve the problems of curve fitting
CO5.	• Identify the types of equations • Solve the problems of numerical integration • Reproduce the algorithms of numerical solution of equations • Calculate the errors of approximations.
CO6.	• Follow the various techniques of statistical methods and numerical methods • Adopt the applications of these methods using computer • Create the computer algorithms of these methods

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO2	3	3	-	3	3	-	-	-	-	-	-	-	3	-
CO3	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO4	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO5	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO6	3	3	-	3	3	-	-	-	-	-	-	-	3	-

- Correlation levels 1, 2 or 3 as defined below:
- 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

F. Recommended Study Material:

❖ Text Books:

1. Richard A. Johnson, Miller and Freund; Probability and Statistics for Engineers. Prentice Hall, 1994.
2. Ross Sheldon; A first course in probability. Pearson Education India, 2002.
3. Ross Sheldon; A course in simulation. Prentice Hall PTR, 1990.
4. Shankar S. Sastry; Introductory methods of numerical analysis. PHI Learning Pvt. Ltd., 2015**.**

❖ Reference Books:

1. Robert V. Hogg, Elliot Tanis and Dale Zimmerman; Probability and statistical inference. Pearson Higher Ed, 2014.
2. Kishor S. Trivedi; Probability and statistics with reliability, queuing and computer science applications. John Wiley & Sons, 2008.
3. Steven C.Chapra and Raymond P. Canale; Numerical methods for engineers. Vol. 2. New York: McGraw-Hill, 2012.
4. VaidyeswaranRajaraman; Computer oriented numerical methods. PHI Learning Pvt. Ltd., 1993.
5. Erwin Kreyszig: Advanced Engineering Mathematics, 9th Ed., Jhon Wiley & Sons, India, 1999.

❖ URL Links:

1. http://numericalmethods.eng.usf.edu
2. http://mathworld.wolfram.com/
3. http://en.wikipedia.org/wiki/Math

IT254: COMPUTER ARCHITECTURE & MICROPROCESSOR INTERFACING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course are:

- To provide introduction to Instruction Set Architecture and Practical exposure through simulation tools/Microprocessor Kits
- To explore the basic concepts of computer organization & computer architecture design, Computer System Components: Processor, Memory, and I/O Devices, Performance evaluation
- To provide insight details in Processor Components: Control Unit, Registers, Caches Memory, ALU, and Instruction Execution Unit.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Computer Architecture	03
2.	Instruction Set Architecture	05
3.	Computer Architecture Space	06
4.	Performance Measures	04
5.	Basics of Arithmetic Logic Unit	10
6.	Processor Design	10
7.	Pipelined Processor	06
8.	Memory Hierarchy	08
9.	Input/Output Subsystem	08

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 95

C. Detailed Syllabus:

1.	**Introduction to Computing Systems** What is Computer Architecture, Abstraction :Software & Hardware, Architecture Levels, Embedded Computers, Different types of processors, Five generation computers Looking into future: Grid Computing, Nano Computing, DNA Computing, Quantum Computing	**03 Hours**	**5%**
2.	**Instruction Set Architecture** Instruction for arithmetic, Instructions to move data, Instruction for decision making, Handling Constant Operands, Implementing loops, pointers Vs Index, Switch Statement, Addresses in MIPS Instructions, Procedural abstractions, Requirements, Sorting example, Register use conventions, Recursive Programs: Activation Record, Calls, Returns(after instruction set architecture)	**05 Hours**	**8%**
3.	**Computer Architecture Space** Architecture Space: MIPS ISA Features, Alternative Architectures Architecture Examples: RISC and CISC, PowerPC, VAX, SPARC, Intel x86	**06 Hours**	**10%**
4.	**Performance Measures** Performance and Cost, Purchasing perspective, Design perspective Notions of Performance: Latency and throughput, Performance and time, computer clocks, Computing CPU time and cycles, Improving Performance, Linking instruction, cycles and time, CIPS and MIPS examples, Computer Benchmarks, Sources of Benchmark: SPEC 89 and SPEC 95. Amdahl's law, Estimating performance improvements, poor performance metrics	**04 Hours**	**7%**
5.	**Basics of Arithmetic Logic Unit** Binary Arithmetic, ALU Design, Signed Operations and Overflow, Multiplier Design, Divider Design, Fast Addition, Multiplication, Floating Point representation and operations, Floating Point Unit Design, Floating Point Arithmetic	**10 Hours**	**17%**

6.	**Processor Design** Introduction, Simple Design Multi cycle approach, control for multi cycle, Micro-programmed Control, Exception Handling	**10 Hours**	**17%**
7.	**Pipelined Processor** Basic Design Idea, Data path and Control, Handling Data Hazards, handling Control Hazards	**06 Hours**	**10%**
8.	**Memory Hierarchy** Basic Idea: Memory construction, size, speed,cost and data unit. Tradeoffs between them.PROM, EEPROM, DRAM, SRAM ,Memory Technologies, Hierarchical organization, principle of locality, Simple Cache organization, Miss rate, block size, cache policies Cache Organization: Mapping alternatives- direct, associative and set associative, processor performance with cache, memory organization and miss penalty, Policies for read, load, fetch, replacement and write, How Caches work, Size of tags, Performance analysis examples Virtual Memory: Similarities and differences of Virtual Memory and Cache, Mapping Virtual address to physical address, Page tables, TLB, Virtually addressed cache, Memory Protection	**08 Hours**	**13%**
9.	**Input/output Subsystem** Interfaces and buses, I/O operations, Designing I/O systems	**08 Hours**	**13%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weight.
- Assignments/ Surprise tests/Quizzes/Seminar based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After learning the course, students will able to

CO1	Identify the addressing mode of instructions and write machine program
CO2	Determine which hardware blocks and control lines are used for specific instructions
CO3	Demonstrate how to add and multiply integers and floating-point numbers using two's complement and IEEE floating point representation
CO4	Use various metrics to calculate and Analyze clock periods, performance, and instruction throughput of single-cycle, multi-cycle, and pipelined implementations of a simple instruction set
CO5	Detect pipeline hazards and identify possible solutions to those hazards to take advantage of super scalar architecture
CO6	Show how cache design parameters affect the performance of program and Map a virtual address into a physical address

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	1	-	3	-	2	-	-	-	-	-	-	-	2	-
CO2	1	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	3	-	3	3	-	-	-	-	3	-	-	2	-
CO5	1	2	1	1	-	-	-	-	-	-	-	1	-	2
CO6	1	1	-	-	-	-	-	-	-	-	-	1	-	1

F. Recommended Study Material:

❖ **Text Books:**

2. John L. Hennesy & David A. Patterson, "Computer Organization & Design: The Hardware / Software Interface", Morgan Kaufmann Publishers, 2004.

❖ **Reference Books:**

4. R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall
5. Computer Organization & Architecture-Designing for Performance, William Stalling, Pearson Prentice Hall (8th Edition).

6. Introduction to Computing Systems: From Bits and Gates to C and Beyond, Yale N. Patt,Sanjay J. Patel, 2nd Edition, Tata McGraw-Hill Publication,2005.
7. Structured Computer Organization, A. S. Tananbum , Pearson Education
8. The Essentials of Computer Organization And Architecture, Linda Null, Julia Lobur, Jones & Bartlett Learning, 2006
9. Computer Architecture & Organization, John P Hayes, McGraw-Hill.
10. Computer System Architecture, Morris Mano (3rd Edition) Prentice Hall.

❖ **Web Materials:**

4. https://godbolt.org/
5. http://pages.cs.wisc.edu/~markhill/cs354/Fall2008/notes/flpt.apprec.html
6. https://www.youtube.com/watch?v=qlH4-oHnBb8
7. https://www.userbenchmark.com/
8. https://nptel.ac.in/courses/106105033/ (For cache memory and Pipelining)

IT255: WEB TECHNOLOGIES

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	0	2	0	2	1
Marks	0	50	0	50	

A. Objective of the Course:

The main objectives for offering the course are:

- To provide introduction about various technologies used in web development task.
- To develop web application from scratch.
- To explore the basic concepts of how web works, web communication, web designing and web development.
- To provide insight details in various tools/frameworks for rapid web development.

Sr. No.	Title of the unit	Minimum number of hours
1.	HTML	6
2.	CSS	6
3.	JavaScript	10
4.	Cutting edge Frameworks for Web Development	8

Total hours (Theory): 00
Total hours (Lab): 30
Total hours: 30

C. Detailed Syllabus:

1. **HTML** — **06 Hours** — **20%**

   HTML Styles, Links, Images, Tables, Lists, Forms, Frames, iframes, HTML semantic elements

2. **CSS** — **06 Hours** — **20%**

   CSS Introduction, CSS Syntax, CSS Id & Class, CSS Box Model, CSS Border, CSS Outline, CSS Margin, CSS Padding, CSS Styling (Backgrounds, Text, Fonts, Links, Lists, Tables), Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity,

	Image Sprites, Media Types, Attribute Selectors, CSS Text Effects, CSS 2D/3D Transformations, Transitions, CSS Animations, CSS Flex		
3.	**JavaScript** **Types of Data in JavaScript:** Numerical Data, Text Data, Boolean Data, And Variables**:** Creating Variables and Giving Them Values, Assigning Variables with the Value of Other Variables. Data Type Conversion: Dealing with Strings That Won't Convert Decisions, Loops, and Functions: if…else, for loop for...in Loop, switch…case, while Loop, do...while loop, break and continue Statements, Creating function with and without arguments, HTML Form and Validation: Button Elements, Text Elements, The textarea Element, Check Boxes and Radio Buttons, Selection Boxes, validation, JavaScript object: String, Array, Regular Expression	**10 Hours**	**33%**
4.	**Cutting edge framework for Web Development** JQuery, AJAX – front-end development, BootStrap – CSS framework	**08 Hours**	**27%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Labs will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in laboratory.
- Assignments/ Surprise tests/Quizzes/Seminar based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Students need to develop a project on technologies learned in laboratory sessions.

E. Student Learning Outcome:

After learning the course, students will able to

CO1	Student should able to understand the tools and technologies to design & develop static and dynamic webpages/apps
CO2	Student should able to build creative UI design for responsive/device independent webpages
CO3	Student should able to select appropriate hosting environment
CO4	Student should able to understand and apply concepts of web security through session and cookies
CO5	Student should able to design, develop and deploy multi-tier web applications

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	1	2	3	-	-	-	-	-	-	-	-	1	1	-
CO2	-	-	-	2	3	-	1	-	1	2	-	1	2	-
CO3	-	2	-	1	2	-	-	-	-	-	1	-	-	1
CO4	3	-	2	-	-	3	1	2	-	-	1	-	3	2
CO5	3	1	3	-	3	2	-	-	1	-	-	1	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

F. Recommended Study Material:

- **Text Books:**
  3. HTML5 and CSS3, Second Edition Level Up with Today's Web Technologies, Brian P. Hogan
- **Reference Books:**
  11. HTML & CSS, Design and Build Websites, Jon Duckett
- **Web Materials:**
  9. https://w3schools.com
  10. http://angularcasts.io/

IT256: DATA STRUCTURES AND ALGORITHMS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course are:

- To familiarize students with basic data structures and their use in fundamental algorithms.
- To teach the students how to select and design data structures and algorithms for a specified problem.
- To teach the students how data will be stored efficiently within computer memory.
- To select appropriate data structure and algorithm for a specified application..

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Data Structure	04
2.	Linear Data Structure	20
3.	Non Linear Data Structure	20
4.	Searching and Sorting	10
5.	Hashing	06

Total hours (Theory) : 60
Total hours (Lab) : 30
Total hours : 90

C. Detailed Syllabus:

1.	**INTRODUCTION TO DATA STRUCTURE**	**04 hours**	**07 %**
1.1	Introduction Introduction to Data, Information, Data Type Different types of Data Type : Built-In and Abstract Data Type		
1.2	Algorithm and Data Structure Algorithm, Program Introduction to Data Structure, Needs for Data Structure Different types of Data Structure		
2.	**LINEAR DATA STRUCTURE**	**20 hours**	**33 %**
2.1	Array Notations : one dimension, two dimension and multi dimension Memory Representation of Array : Row Order and Column Order Concept of Sparse Matrices		
2.2	Stack Memory Representation of Stack Operations : push, pop, peep, change Applications of Stack: Recursion : Recursive Function Tracing, Tower of Hanoi Conversion : Infix to Postfix Evaluation : Prefix and Postfix expression		
2.3	Queue Memory Representation of queue Simple Queue : Insert and Delete operation Circular Queue : Insert and Delete operation Concepts of : Priority Queue, Double-ended Queue Applications of Queue		
2.4	Linked List Memory Representation of LL Singly Linked List: Insert at First, Insert at End, Insert according to Sorted order, Delete the specified node. Doubly Linked List : Insert and Delete operation Concept of Circular Linked List Applications of Link List		
3.	**NON LINEAR DATA STRUCTURE**	**20 hours**	**33%**
3.1	Tree Tree Concepts (Tree, Binary, Full Binary, Complete Binary) Memory Representation of Tree		

Tree Traversal Techniques : Pre-order, Post-order and In-order (Recursive and Iterative)
Binary Search Tree: Iterative and Recursive: Insert and Delete Operations with all options.
Concept of Threaded Binary Tree, B- Tree
General Tree to Binary Tree Conversion
Height-Balance Tree(AVL Tree) : Insert and Delete Operations
Applications of Tree : Manipulation of Arithmetic Expression, Decision Tree, Hierarchical Tree(Family Tree), Directory structure of File system

3.2 Graph
Graph concepts (undirected, directed, simple, multi, weighted, null, mixed, cycle, path, forest)
Memory Representation of Graph, BFS and FS, Applications of Graph

4. SEARCHING AND SORTING **10 hours** **17%**

4.1 Searching
Sequential Search ,Binary Search : Iterative and Recursive

4.2 Sorting
Different Sorting Techniques
Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Radix Sort, Heap Sort

5. HASHING **06 hours** **10 %**

5.1 Hashing
Collision-Resolution Techniques : rehashing and chaining
Different Hashing Functions: Division, Mid-square, Folding, Length-dependent, Digit Analysis, Multiplicative
Applications of Hashing

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use coached problem solving method as it is class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.
- Attendance is compulsory in lectures and laboratory which carries 5% component of the overall evaluation.

• Minimum two internal exams will be conducted and it will be considered as a part of 15% continuous evaluation.

• Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.

• Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.

• The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

• Minimum 10 experiments are suggested in the laboratory related to course content

E. Student Learning Outcome:

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

CO1	Describe how different data structures are represented in memory and used by algorithms/program.
CO2	Demonstrate different operations for various data structures.
CO3	Describe and implement an appropriate data structure for various applications.
CO4	Apply and compare alternative implementations of different searching and sorting techniques with respect to performance.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	-	-	-	-	-	-	-	3	2
CO2	2	-	2	-	1	-	-	-	-	-	-	-	3	1
CO3	3	3	3	-	1	-	-	-	-	-	-	-	3	2
CO4	2	2	2	1	1	-	-	-	-	-	-	-	3	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Text book:**
  1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson, McGraw-hill.

❖ **Reference book:**

A. Classic Data structures, D.Samanta, Prentice-Hall International.

B. Data Structures using C & C++, Ten Baum, Prentice-Hall International.

C. Data Structures Using C, Oxford Higher Education, Reema Thareja

D. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, Thomson Learning.

E. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, W. H. Freeman.

F. Data Structure through C (A Practical Approach) , Dhanpat Rai & Co., G. S. Baluja

❖ **Web material:**

1. http://www.itl.nist.gov/div897/sqg/dads
2. http://www.leda-tutorial.org/en/official/ch02s02s03.html
3. http://www.leda-tutorial.org/en/official/ch02s02s03.html
4. http://www.softpanorama.org/Algorithms/sorting.shtml

IT257: DATABASE MANAGEMENT SYSTEM

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

Databases are storehouse or repository for organizational information. Storing and efficient usage of information is crucial for any system. All organizations, large and small, must rely on data management in all aspects of business operations and management information systems.

The main objectives for offering the course Database Management System are:

- To understand the overall structure and design of DBMS software.
- To cover three major aspects of data: concurrency, integrity, and recovery.
- To give the motivations behind development of DBMS and Structured Query Language used with relational databases.
- To make students familiar with the concepts of database in computerized application.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introductory concepts of DBMS	06
2.	Entity-Relationship model	06
3.	Formal Relational Query Languages	06
4.	Relational Database Design	12
5.	Transactions	10
6.	Concurrency Control	10
7.	Recovery System	05
8.	Indexing	05

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1.	**Introductory concepts of DBMS** Introduction and applications of DBMS, Purpose of database, Data Independence, Database System architecture- levels, Mappings, Database users and DBA	**06 Hours**	**10%**
2.	**Entity-Relationship model** Basic concepts, Design process, Constraints, Keys, Design issues, E-R diagrams, Weak Entity Sets, Extended E-R features Generalization, Specialization, Aggregation, Reduction to E-R database schema	**06 Hours**	**10%**
3.	**Formal Relational Query Languages** Structure of Relational Databases, Domains, Relations, Relational Algebra fundamental Operators and Syntax, Relational algebra queries	**06 Hours**	**10%**
4.	**Relational Database design** Functional Dependency–definition, Trivial and Non-Trivial FD, Closure of FD set, Closure of attributes, Irreducible set of FD, Normalization – 1NF,2NF,3NF, Decomposition using FD-Dependency Preservation, Multi-valued dependency& 4NF, Join Dependency & 5NF	**12 Hours**	**20%**
5.	**Transactions** Transaction concepts, A Simple Transaction Model, Properties of Transactions, Serializability of transactions, Testing for Serializability	**10 Hours**	**18%**
6.	**Concurrency Control** Lock-Based Protocol, Timestamp-Based Protocol, Multiple Granularity, Deadlock Handling	**10 Hours**	**18%**
7.	**Recovery System** Failure Classification, Recovery and Atomicity, Log-based recovery, Transaction rollback and checkpoints, System recovery	**05 Hours**	**07%**
8.	**Indexing** Basic Concepts, Ordered Indices, B+-Tree Index Files, B-Tree Index Files	**05 Hours**	**07%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc. Faculty would use the approach teaching with data as it would help to find and integrate real data sets into their classes.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weight.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After learning the course, students will able to

CO1	Identify the data models for relevant problems.
CO2	Demonstrate the basic elements of a relational database management system.
CO3	Design entity relationship, Convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
CO4	Demonstrate their understanding of transactions processing and recovery techniques to recover from the crashes.
CO5	Understand the uses of Database Schema and need of Normalization and Extend normalization for the development of application software's.

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	-	3	2	2	-	-	-	-	-	-	-	-	1	-
CO2	3	-	-	-	1	-	-	-	-	-	-	-	3	-
CO3	-	-	3	2	3	-	-	-	-	-	-	-	-	2
CO4	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	2	3	-	-	-	-	-	-	-	2	2

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Text Books:**
  4. Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill.
  5. An introduction to Database Systems, C J Date, Addition-Wesley
- **Reference Books:**
  12. "Fundamentals of Database Systems", R. Elmasri and S. B. Navathe, The Benjamin /Cumming Pub. Co
  13. SQL,PL/SQL the Programming Language of Oracle,IvanBayross, BPB Publications
  14. Oracle: The Complete Reference, George Koch, Kevin Loney, Oracle Press.
- **Web Materials:**
  11. http://www.sql.org
  12. http://www.w3schools.com
  13. http://www.sqlcourse.com
  14. https://www.youtube.com/playlist?list=PLUd8M7XZdd6FT24ouEYl4RPpgXY9c_1uI

IT258: SOFTWARE GROUP PROJECT

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	0	**2**	0	2	**1**
Marks	0	50	0	**50**	

F. Objective of the Course:

The main objectives for offering the course are:

- To increase awareness and enhance knowledge of students in developing software projects compatible with industry standard, technology and latest development in field of Computer and IT.
- To provide exposure in the field of Software development and apply various tools in software development life cycle.
- To provide additional technical skill useful for the project work.
- To develop and test one's ability to learn independently, continually and interact with multidisciplinary groups.
- To provide a deep understanding of various domains of software projects and ability to solve practical/utility problems.

G. Outline of the Course:

- Students at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.

- Students have to submit project with following listed documents at the time of final submission.
    a Project Synopsis
    b. Software Requirement Specification
    c. SPMP
    d. Final Project Report/paper
    e. Project Setup file with Source code [Uploaded on GitHub]
    f. Project Presentation (PPT)
    g. Video Recording (Per Project)
- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00
Total hours (Lab): 30
Total hours: 30

H. Instructional Method and Pedagogy:

- Project Groups would be form of maximum two students.
- Inter batch group formation is not permitted due to difficulties in progress tracking.
- Students are advised to choose innovative and challenging definitions.
- Batch wise project definitions must be unique.
- Any kind of management system would not be encouraged.
- Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
- Student has to prepare Report/Paper at end of semester as part of submission.
- Report/Paper structure is finalized for semester end submission.
- To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for internal reviews, which will help them to get more insight in the project.
- To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check before 15 days of external exam.

- Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
- Students have to bring internal review card hard copy on the day of internal review exam, after that they will bring filled review card on the day of external review.

I. Student Learning Outcome:

After learning the course, students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.
CO5	Solve communication issues in large, complex software projects and Structure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

J. Recommended Study Material:

❖ **Reference book:**

5. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
6. Sanjay Mohapatra, Software Project Management, Cengage Learning
7. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, "Engineering Design – A Project Based Introduction", Wiley India Pvt. Ltd.
8. B. Hughes & M. Cotterell, "Software Project Management", Tata Mcgraw Hills.

❖ **Web Materials:**

8. https://status.net/templates/project-report/
9. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
10. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
11. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
12. https://nptel.ac.in/courses/106/105/106105218/
13. https://www.youtube.com/watch?v=T3q6QcCQZQg
14. https://www.scribbr.com/category/research-paper/

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 5)

CHAROTARUNIVERSITY OF SCIENCE AND TECHNOLOGY

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Design and Analysis of Algorithm are

- To explain the fundamentals of computer algorithm and create analytical skills, enable students to design algorithms for various applications, and analyze the algorithms.
- To introduce mathematical aspects and analysis of algorithms, sorting and searching algorithms, algorithmic techniques and algorithmic design methods which help in development of software.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Basics of Algorithm and Mathematics	04
2.	Analysis of Algorithm	08
3.	Divide and Conquer Algorithm	08
4.	Greedy Algorithm	07
5.	**Dynamic Programming**	10
6.	**Exploring Graphs**	04
7.	**String Matching and NP Completeness**	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Basics of Algorithm and Mathematics**	**04 hours**	**08%**
1.1	What is an algorithm?		
1.2	Mathematics for Algorithm		
1.3	Performance Analysis, Model for Analysis - Random Access Machine (RAM), Primitive Operations		
1.4	Time Complexity and Space Complexity		
2.	**Analysis of Algorithm**	**08 hours**	**18%**
2.1	The efficiency of algorithm, Best, Average and Worst case Analysis		
2.2	Asymptotic Notation		
2.3	Solving Recurrence Equation		
2.4	Sorting Algorithm		
3.	**Divide and Conquer Algorithm**	**08 hours**	**18%**
3.1	Basic of Recursion and its complexity		
3.1	The general template for Divide and Conquer Problem		
3.2	Problem solving using divide and conquer algorithm – Binary Search, Sorting - Merge Sort and Quick Sort		
3.3	Strassen'sMatrix Multiplication		
4.	**Greedy Algorithm**	**07 hours**	**16%**
4.1	General Characteristics of greedy algorithms		
4.2	Problem solving using Greedy Algorithm: Making change problem		
4.3	The Knapsack Problem, Job Scheduling Problem		
4.4	Minimum Spanning Trees (Kruskal's Algorithm, Prim's Algorithm)		
4.5	Dijkstra Algorithm		
5.	**Dynamic Programming**	**10 hours**	**23%**
5.1	Introduction, The Principle of Optimality		
5.2	Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient		
5.3	Making Change Problem, Assembly Line Scheduling		

5.4 Knapsack Problem, All pair Shortest Path

5.5 Matrix Chain Multiplication

5.6 Longest Common Subsequence

6. Exploring Graphs and Backtracking **04 hours** **08%**

6.1 An introduction to Graph, Basic Definitions

6.2 Traversing Graphs – Depth First Search, Breadth First Search, Topological Sort

6.3 Backtracking – The Eight Queen Problem

6.4 **The Knapsack Problem**

6.5 Branch and Bound – The Assignment Problem

7. String Matching and NP Completeness **04 hours** **08%**

7.1 Introduction

7.2 The naïve string matching algorithm

7.3 The Rabin-Karp algorithm

7.4 Introduction to NP Complete Theory

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

CO1	Students will able to analyze the performance of algorithms.
CO2	Students will able to select appropriate design techniques for effective solution of the problem.
CO3	Ability to find time and space complexity of the algorithm.

Course Articulation Matrix:

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

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

1. Gills Brassard, Paul Brately, Fundamental of Algorithms, Prentice Hall of India

❖ **Reference Books:**

2. Thomas H. Coreman, Charles E. Leiserson, Ronald Rivest and Clifford Stein, Introduction to Algorithms, MIT Press
3. Ellis Horowitz, SartazSahni and SanguthevarRajasekarn Fundamental of Computer Algorithms, Computer Science Press

❖ **URL Links:**

1. http://www.itl.nist.gov/div897/sqg/dads
2. http://www.stanford.edu/class/cs161
3. http://highered.mcgraw-hill.com/sites/0073523402

IT342: ADVANCED WEB TECHNOLOGIES

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	2	0	4	3
Marks	100	50	0	150	

A. The main objective to give the course Advance Web Technology is

- Know the techniques for improving the accessibility of an HTML document
- Know the techniques involved to support reach web development application.
- Students understand the web development and database technology.
- To give the fundamental skills needed to understand the concepts of web development.

B. **Outline of the course:**

Sr No.	Title of the unit	Minimum number of hours
1.	Web Server.	01
2.	Server Side Language (PHP)-Part1	09
3.	Server Side Language (Object oriented PHP)-Part 2	06
4.	MySQL	05
5.	XML, XML Schema, XML DOM	03
6	Web services and RESTful PHP Web service	02
7.	RSS, RDF, SPARQL, OWL	02
8.	JQuery and AJAX	02

Total hours (Theory): 30Hrs.

Total hours (Lab): 30Hrs.

Total hours: 60Hrs.

C. Detailed Syllabus:

1.	**Web Server**	**01 hours**	**3%**

Introduction, Apache Web server, IIS6.0/7.0, WAMP, XAMPP

2	**Server Side Language (PHP) Part -1**	**09 hours**	**30 %**

Embedded PHP in HTML, Adding Dynamic content, Accessing form variable, Understanding Identifier, Operator, Decision and loops, Function, Array and String manipulation, Preserving state with Query Strings, Session and cookies, Working with files and directories, Regular expression.

3	**Server Side Language (Object oriented PHP)-Part 2**	**06 hours**	**20%**

Understanding OOP concept, Creating classes ,attributes and operators, controlling access, Error and Exception handling, security and encryption (Preventing session fixation, protecting again form spoofing, input filter, cross site scripting, SQL injection, Password security), Data encryption

4	**MySQL**	**05 hours**	**17 %**

Introduction, Installation, Administration, PHP Syntax, Connection, Create Database

Drop Database, Select Database, Data Types, Create Tables, Drop Tables, Insert Query, Select Query, Where Clause, Update Query, Delete Query, Like Clause Sorting Results ,Using Join NULL Values , Transactions ,Alter Command Indexes ,Temporary Tables ,Clone Tables ,Database Info ,Using Sequences, Handling Duplicates, Database Export, Database Import, MySql useful Function

5	**XML, XML Schema, XML DOM**	**03 hours**	**10 %**

XML Introduction, How to use, XML Tree, XML Syntax, XML Elements, XML Attributes, XML Validation, XML Validator, XML Viewing, XML CSS, XSLT Introduction, XSLT Browsers, XSLT Transform, XSLT ‹template› ,XSLT ‹value-of›, XSLT ‹for-each›, XSLT ‹sort›, XSLT ‹if›, XSLT ‹choose›, DOM Introduction, Manipulate Nodes

6	**Web services and RESTful PHP Web service**	**02 hours**	**07 %**

Introduction to SOAP, WSDL and UDDI, Writing Web Services, Client, Resource Oriented Architecture, Designing Read only resource oriented Service, Web

7	**RSS, Semantic Web Programming (RDF, SPARQL and OWL)**	**02 hours**	**07 %**

RSS Introduction, RSS History, RSS Syntax , RSS ‹channel›, RSS ‹item›, RSS Publish Feed, RSS Read a Feed, Introduction to Semantic web programming, Modeling Information, RDF Rules, RDF Elements, RDF Containers, RDF Collections, RDF Schema, RDF Dublin Core, RDF OWL,

8	**JQuery and AJAX**	**02 hours**	**07 %**

Introduction, Selecting Elements, Handling Events, Styling and Animating, Manipulating the DOM, XMLHTTPRequest Object, Asynchronous HTML and HTTP, Sending Data with AJAX.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

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

CO1	Understand web based application using suitable client side and server side web technologies.
CO2	Apply Object Oriented concepts in developing PHP applications.
CO3	Understand the major areas and challenges of web programming.
CO4	Develop and deploy sustainable solution to complex problems using appropriate method, technologies, frameworks, and web services.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	1	-
CO2	2	-	3	-	3	1	-	-	-	-	-	-	2	-
CO3	-	3	-	3	-	-	-	-	-	-	-	-	1	-
CO4	3	-	-	-	1	-	3	-	2	-	-	3	3	3

F. Recommended Study Material:

- **Text Books:**

  1. PHP5 UInleashed, John Coggeshall, ByAdam Trachtenberg, David SklarPublisher, Sams Publishing
  2. PHP and MySQL Web Development ,Luke Welling, Laura Thomson, Sams Publishing
  3. Beginning PHP 5.3 ,Wrox , Matt Doyle
  4. Restful Web Services,Leonard Richardson, Sam Ruby, David Heinemeier Hansson,, O'Reilly

- **Reference Books:**

  1. Learning PHP 5 David Sklar, O'Reilly
  2. XML Pocket Consultant William R. Stanek , Microsoft
  3. RESTful Web Services Cookbook: Solutions for Improving Scalability and Simplicity, subbu Allamaraju, O'Reilly
  4. Developing Web Widget with HTML, CSS, JSON and AJAX: A Complete Guide to

5. Web Widget, Rajesh Lal , Lakshmi C Chava
6. AJAX in Practice , Dave,Crane,Bear Bibeault, Jord Sonneveld ,Manning
7. AJAX stater Kit, Phil Ballard, Sams
8. Semantic web programming John Hebeler, Matthew Fisher, Andrew Perez-Lopez, Ryan Blace, Wiley
9. Semantic web programming Toby Segaran, Colin Evans, and Jamie Taylor O'Reilly

❖ **Reference Links/ e-content:**

1. www.w3schools.com
2. www.learnphp-tutorial.com
3. http://www.designzzz.com/advance-php-tutorials-scripts/

IT343: OPERATING SYSTEM

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. In particular, the course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

The main objective of the course is,

- To give the fundamental knowledge of how operating system manages the applications that are running. Set a suitable environment for applications to run.
- To understand process management, memory management including virtual memory, protection and security management

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction	03
2.	System Structures	03
3.	Process Management	06
4.	Process scheduling	06
5.	Process Coordination	06
6.	Deadlocks	06
7.	Memory Management	15
8.	File System	06
9.	Secondary Storage Structure & I/O systems	06
10.	System Security	03

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1. **Introduction** — **03 hours** — **05 %**
   What is Operating System & evolution of OS, Computer-System Organization & Architecture, OS Structure & Operations, Special purpose Systems, Open-source OS
2. **System Structures** — **03 hours** — **05 %**
   OS Services, System calls, Types of system calls, OS Structure: Layered, Microkernel, Operating system Generation, Booting
3. **Process Management** — **06 hours** — **10 %**
   Process, Process Control Block, Process States, Scheduling concepts, Process creation Threads, Types of Threads, Multithreading, Issues & termination
4. **Process scheduling** — **06 Hours** — **10 %**
   Concept, Scheduler, Preemptive Scheduling, Criteria, Scheduling Algorithms: FCFS, SJF, RR, Priority, Multi-queue
5. **Process Coordination** — **06 hours** — **10 %**
   Race Conditions, Critical Section, Peterson's Solution, Hardware Solution, Strict Alternation, Semaphores
   Classical IPC Problems: The Bounded-Buffer (Producer Consumer) Problem, Reader's & Writer Problem, Dinning Philosopher Problem, Monitors
6. **Deadlocks** — **06 hours** — **10 %**
   Deadlock Problem, Deadlock Characterization, Resource-allocation graph, Deadlock Prevention, Deadlock avoidance: RAG & Banker's algorithm for single & multiple resources, Deadlock Detection, Recovery
7. **Memory Management** — **15 hours** — **25 %**

	Address binding, Address space, Swapping, Contiguous Memory Allocation Paging, Page table: Hierarchical, Hashed, Inverted Segmentation, Virtual-Memory: Demand Paging, Page Replacement algorithms: FIFO, Optimal, LRU, second chance, LFU & MFU, Working set model, Thrashing, Frame Allocation		
8.	**File System** File concept, Access methods, Directory & Disk Structure, File protection: Type, access control File System Structure, Implementation, Directory Implementation, Allocation Methods, Free space management,	**06 hours**	**10 %**
9.	**Secondary Storage Structure & I/O systems** Disk: structure, Arm scheduling: FCFS, SSTF, SCAN, LOOK, Formatting & Boot block, RAID Structure & levels I/O Hardware, Interrupt, DMA, Block & Character devices, Network devices, Transforming I/O request to Hardware operations	**06 hours**	**10 %**
10.	**System Security** Goals of protection, domain of protection, Trojan Horse, Viruses, Worms	**03 hours**	**05 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

CO1	Students will able to exhibit familiarity with the fundamental concepts of operating systems

CO2	Students will able to exhibit competence in recognizing operating systems features and issues
CO3	Students will able to apply a mature understanding of operating system designed how it impacts application systems design and performance.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO2	2	3	2	-	1	-	-	-	-	-	-	-	3	2
CO3	2	2	3	1	1	-	-	-	-	-	-	-	2	3

F. Recommended Study Material:

❖ **Text Books:**

1. Operating System Concepts, 9th Edition by AviSilberschatz, Peter Baer Galvin, Greg Gagne, Wiley Publication.

❖ **Reference Books:**

2. Modern Operating Systems, 3rd Edition by Andrew S. Tanenbaum, PHI
3. Operating System – Internals & Design Principles, William Stallings, PHI
4. Operating Systems, D. M. Dhamdhare, TMH
5. Unix System Concepts & Applications, 4E, Sumitabha Das, TM
6. Unix Shell Programming, Yashwant Kanitkar, BPB Publications.

IT352: COMPUTER NETWORKS

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Computer Network are:

- To learn the basics of data communications technologies.
- To build knowledge on various OSI and TCP/IP.
- To study the working principles of LAN and its standards.
- To build skills in working with Ethernet Protocols to develop simulated environment.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Computer Networks and the Internet	03
2.	Application Layer	10
3.	Transport Layer	13
4.	The Network Layer	10
5.	The Link Layer: Links, Access Networks, and LANs	06
6.	Network Management	03

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Computer Networks and the Internet**	**03 hours**	**08 %**
1.1	What Is a Protocol?		
1.2	Access Networks		
1.3	Physical Media		
1.4	Packet Switching & Circuit Switching		
1.5	Delay, Loss, and Throughput in Packet-Switched Networks		
2.	**Application Layer**	**10 hours**	**22 %**
2.1	Principles of Network Applications		
2.2	The Web and HTTP		
2.3	File Transfer: FTP		
2.4	SMTP		
3.	**Transport Layer**	**13 hours**	**30 %**
3.1	Introduction and Transport-Layer Services		
3.2	Multiplexing and DE multiplexing		
3.3	Connectionless Transport: UDP		
3.4	Principles of Reliable Data Transfer		
3.5	Connection-Oriented Transport: TCP		
3.6	Principles of Congestion Control		
4.	**The Network Layer**	**10 hours**	**22 %**
4.1	Introduction		
4.2	Virtual Circuit and Datagram Networks		
4.3	What's Inside a Router?		
4.4	The Internet Protocol (IP): Forwarding and Addressing in the Internet		
4.5	Routing Algorithms		
5.	**The Link Layer: Links, Access Networks, and LANs**	**06 hours**	**12 %**
5.1	Introduction to the Link Layer		
5.2	Error-Detection and -Correction Techniques		
5.3	Multiple Access Links and Protocols		
5.4	Switched Local Area Networks		
6	**Network Management**	**03 hours**	**07 %**
6.1	What Is Network Management?		

6.2 The Infrastructure for Network Management

6.3 The Internet-Standard Management Framework

7 Self-Study Topics

Data Centre Networking, Socket Programming with UDP,
Socket Programming with TCP

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will learn the fundamentals of Computer Networking & its applications.
- Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.

F. Recommended Study Material:

❖ **Text Book**

1. Computer Networking: A Top-Down Approach James F. Kurose, University of Massachusetts, Amherst Keith W. Ross, Polytechnic University, Brooklyn

❖ **Reference Materials:**

1. Computer Networks by Andrew S Tanenbaum.
2. Data Communication And Networking by BehrouzForouzan

❖ **Web Materials:**

1. www.ietf.org – For drafts
2. www.ieee.org – For standards and technical research papers
3. http://nptel.iitm.ac.in/courses.php?disciplineId=117

Course Outcome (COs):

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

CO1	Analyze layered network architecture and passage of data over communication links
CO2	Analyze delay models in Data Networks using Queueing Systems for messaging and delay sensitive applications
CO3	Design and analyze routing algorithms for Internet and multi-hop autonomous networks
CO4	Analyze flow and rate control algorithms between a sender and receiver in wide area networks
CO5	Apply the network fundamentals to analyze performance.
CO6	Use key networking algorithms in simulation.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	-	-	-	-	-	-	-	2	-
CO2	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO3	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO4	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	-	-	-	-	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

IT353: SOFTWARE GROUP PROJECT - II

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	0	2	-	2	1
Marks	0	50	-	50	

A. Objective of the Course:

The main objectives for offering the course are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently.
- To provide exposure in the field of Software development.
- To provide a deep understanding of various domains of software projects.
- To provide an innovative ability to solve practical/utility problems.
- To provide a capacity to learn continually and interact with multidisciplinary groups.

B. Outline of the Course:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work weekly to respective internal guide.
- Project will be evaluated at least once per week in laboratory during the semester and final submission at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.
- Students have to submit project with following listed documents at the time of final submission.
    a. Project Synopsis
    b. Software Requirement Specification
    c. SPMP

d. Final Project Report/paper

e. Project Setup file with Source code [Uploaded on GitHub]

f. Project Presentation (PPT)

g. Video Recording (Per Project) A student has to produce some useful outcome by conducting experiments or project work.

- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 30

Total hours: 30

C. Instructional Method and Pedagogy:

1. Project Groups would be form of maximum two students.
2. Inter batch group formation is not permitted due to difficulties in progress tracking.
3. Students are advised to choose innovative and challenging definitions.
4. Batch wise project definitions must be unique.
5. Any management system would not be encouraged.
6. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
7. Student has to prepare report at end of semester as part of submission.
8. Report structure is finalized for semester end submission.
9. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
10. To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check before 15 days of external exam.
11. Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
12. Students have to bring internal review card hard copy on the day of internal review exam, after that they will bring filled review card on the day of external review.

D. Student Learning Outcome:

After the completion of the course students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.
CO5	Solve communication issues in large, complex software projects and Structure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Reference book:**

9. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
10. Sanjay Mohapatra, Software Project Management, Cengage Learning

11. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, “Engineering Design – A Project Based Introduction”, Wiley India Pvt. Ltd.
12. B. Hughes & M. Cotterell, “Software Project Management”, Tata Mcgraw Hills.

❖ **Web Materials:**

15. https://status.net/templates/project-report/
16. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
17. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
18. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
19. https://nptel.ac.in/courses/106/105/106105218/
20. https://www.youtube.com/watch?v=T3q6QcCQZQg
21. https://www.scribbr.com/category/research-paper/

IT371: ADVANCED JAVA PROGRAMMING (ELECTIVE I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	0	6	4
Marks	100	100	0	200	

A. Objective of the Course:

The main objectives for offering the course Advanced Java Programming are:

- To explain the key components of a J2EE system and understand how they interact.
- To develop an understanding of the various configurations and proper techniques for constructing Servlets, JSP and EJB applications

B. Outline of the Course:

Sr No.	Title of the unit	Minimum Number of Hours
1	RMI Programming	04
2	JDBC SQL Programming	04
3	Java mail API	02
5	Java Security	02
6	Servlet	06
7	JSP	06
8	Java Media Framework	06

Total hours (Theory): 30

Total hours (Lab): 60

Total hours: 90

C. Detailed Syllabus:

1	**RMI Programming**	**04 hours**	**13%**
1.1	Introduction to RMI, Serializable Classes, Remote Classes and Interfaces, Programming a Client, Programming a Server, Starting the Server, Running a Client, Security		
2	**JDBC SQL Programming**	**04 hours**	**13%**
2.1	The JDBC Connectivity Model		
2.2	Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data		
2.3	Error Checking and the SQLException Class, The SQLWarning Class		
2.4	The Statement Interface, The Result Set Interface, Updatable Result Sets		
2.5	JDBC Types		
2.6	Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management		
3.	**Java mail API**	**02 hours**	**07%**
3.1	JavaMail (Version 1.2), Java Activation Framework (JAF), Send a Simple Email, Send an HTML Email, Send Attachment in Email, Deleting Email, Forwarding Email, JavaMail – GMail via SSL, JavaMail – GMail via TLS		
4.	**Java Security**	**02 hours**	**07%**
4.1	J2EE security concepts, JVM Security		
4.2	Security management, java API security, browser security		
4.3	Web services security classification, security within a web services tier, programmatic security		
5	**Servlet**	**06 hours**	**20%**
5.1	Overview of Servlet Architecture		
5.2	The Servlet Model and Http Servlets, HTTP and Server Programs		
5.3	Handling Exceptions, Session Management, Filters		
6	**JSP**	**06 hours**	**20%**

6.1	Introduction to JSP, Writing JSP Pages, Translation and Compilation.		
6.2	Errors and Exceptions Handling		
6.3	Including and Forwarding from JSP Pages, Expression Language, Custom Actions and Tag Libraries		
6.4	JavaServer Pages Standard Tag Library(JSTL)		
7	**JAVA Media Framework**	**06hours**	**20%**
7.1	Introduction to Framework		
7.2	3D Graphics		
7.3	Internationalization		
7.4	Case Study: Deploying n-tier Application		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

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

CO1	Design, create, test, and maintain J2EE components.
CO2	Apply object-oriented analysis and design techniques during development of an application.
CO3	Use the various components like Servlets, JSPs, EJBs, involved in developing J2EE applications along with some advanced features like JMS, JNDI, JavaMail API etc.
CO4	Design application based on MVC architecture and its usage.
CO5	Create various xml files used for server configuration, application configuration, etc.
CO6	Package and deploy a J2EE application. Students will have thorough understanding of JAR, WAR and EAR files.

- **Course Articulation Matrix:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	2	-	-	-	-	-	-	-	2	-
CO2	1	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	-	-	-	-	3	-	-	-	-	-	-	-	3	3
CO4	-	-	3	-	2	-	-	-	-	2	2	-	2	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	2	2	-	-	-

F. Recommended Study Material:

❖ **Text Books:**

1. James Keogh, The Complete Reference,TATA McGraw-Hill.
2. James L. Weaver, Kevin Mukhar, and Jim Crume, Beginning J2EE 1.4: From Novice to Professional, Wrox
3. Bryan Basham, Kathy Sierra, and Bert Bates, Head First Servlets and JSP: Passing the Sun Certified Web Component Developer Exam, O'Reilly Media

❖ **Reference Books:**

4. Kathy Sierra and Bert Bates, Head First EJB, O'Reilly Media
5. Richard Monson-Haefel, J2EE Web Services: XML SOAP WSDL UDDI WS-I JAX-RPC JAXR SAAJ JAXP,Addison-Wesley Professional

❖ **Web Materials:**

1. http://www.service-architecture.com/application-servers/articles/j2ee_web_site_architecture.html
2. http://www.oracle.com/technetwork/java/javaee/overview/index.html
3. http://www.roseindia.net/struts/hibernatespring/index.shtml
4. http://www.roseindia.net/jsf/

IT373: EMBEDDED SYSTEMS (ELECTIVE I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	0	6	4
Marks	100	100	0	200	

A. Objective of the Course:

The main objectives for offering the course Embedded Systems are:

- To have a basic proficiency in a traditional embedded C language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
- To have an understanding of the basic issues of embedded software development and associated hardware.
- To have a basic understanding of some of the more advanced topics of embedded systems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of hours
1.	Introduction to Embedded System.	04
2.	Embedded Software.	07
3.	Embedded System Development.	06
4.	Real Time Operating System.	06
5.	Real Time Programming Issues.	05
6.	Case Study of embedded and real-time operating systems, real time applications	02

Total hours (Theory):30

Total hours (Lab): 60

Total hours: 90

C. Detailed Syllabus:

1. **Introduction to Embedded System.** **04 hours 13%**
   - 1.1 Characteristics of Embedded System.
   - 1.2 Types of Embedded Systems.
   - 1.3 Examples of Embedded Systems.

2. **Embedded Software.** **07 hours 25%**
   - 2.1 Embedded Programming in C and C++
   - 2.2 Source Code Engineering Tools for Embedded C/C++
   - 2.3 Program Modeling Concepts in Single and Multiprocessor Systems
   - 2.4 Software Development Process
   - 2.5 Software Engineering Practices in the Embedded Software Development

3. **Embedded System Development.** **06 hours19%**
   - 3.1 Embedded software development tools – Emulators and debuggers.
   - 3.2 Design issues and techniques
   - 3.3 Case studies
   - 3.4 Complete design of example embedded systems

4. **Real Time Operating System.** **06 hours20%**
   - 4.1 Typical OS structure.
   - 4.2 RTOS structure.
   - 4.3 The context of its use.
   - 4.4 Schedule management for multiple tasks.
   - 4.5 Scheduling in real time.
   - 4.6 Interrupt routines in RTOS environment.
   - 4.7 RTOS task scheduling models.
   - 4.8 List of basic actions in pre-emptive scheduler and expected time taken.

5 **Real Time Programming Issues.** **05 hours17%**
   - 5.1 Real time programming issues during software development process
   - 5.2 Distinction between functions, ISR and tasks.

5.3 Problems of sharing data in RTOS.

5.4 Inter-process communication in RTOS.

5.5 Interrupt servicing mechanism.

5.6 Context and periods for context switching.

5.7 Deadline and Interrupt latency.

6 Case Study of embedded and real-time operating systems, real time applications. 02 hours 06%

6.1 Case study of RTOS using MUCOS.

6.2 Case study for RTOS based programming.

6.3 Coding for Automatic Chocolate vending machine using MUCOS.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

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

CO1	Understand the fundamental skills knowledge of embedded system, different examples, its characteristics
CO2	Understand operating system and do basic programming of real time operating system
CO3	Able to identify different networks which are used in embedded system design and interface various peripheral devices
CO4	Analysis the systems requirements to meet the specifications

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	-	-	-	-	-	1	-	1	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3	3
CO3	2	3	3	3	3	1	1	-	2	-	-	-	3	2
CO4	3	3	2	3	2	1	1	-	2	-	1	2	3	2

F. Recommended Study Material:

❖ Text Books

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003.
2. WayneWolf, "Computers as Components: Principles of Embedded Computer SystemDesign", Elsevier, 2006.

❖ ReferenceBooks

3. SriramIyer and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw-Hill, 2004.
4. F. Vahid, T. Givargis, Embedded System Design, John Wiley and Sons, 2002
5. Code generation for Embedded Processors by Peter Marwedel, G. Goosens, KlunerAcademic Pub. 1993.

IT374: Python Programming [Elective-I]

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	0	4	4
Marks	100	100	0	200	

A. Objective of the Course:

This subject introduces python programming language. It emphasizes use of python programming in multiple domains.

The objective of course is,

- To various construct available in python.
- To use python for different domain of Web Development, general purpose programming, Backend development, Scientific Experimentation, artificial Intelligence etc.
- To teach how to take the statement of a problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic.
- To demonstrate how to test and prepare a real time application using python.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Applications of Python Programming	01
2.	Compilers and Editors for python programs	01
3.	Operators , I/O , control structures	06
4.	Basic Data types	04
5.	List and Dictionaries	06
6.	Functions	02
7.	Object and Classes in Python	02
8.	File Handling	02
9.	Use of Libraries: Numpy, Pandas	06

Total hours (Theory): 30
Total hours (Lab): 60
Total hours: 90

C. Detailed Syllabus:

1.	**Applications of Python Programming** History of Python, Python Features,	**01 hours**	**4 %**
2.	**Python - Environment Setup** Local Environment Setup, Installing Python, Setting up PATH, Python Environment Variables	**01 hours**	**4 %**
3.	**Operators , I/O , control structures** Types of Operator, Input function, If, If..else and nested if.	**06 hours**	**19 %**
4.	**Basic Data types** Inheritance: Using super creating multilevel Hierarchy, method overriding, Dynamic method dispatch, abstract classes, Using final with Inheritance, Using Package: Defining package, Finding package and CLASSPATH, Access protection, Importing package, Interface: Defining Interface, Implementing Interface, Variables in Interface	**04 hours**	**14 %**
5.	**List and Dictionaries** Accessing Values in Lists, Updating Lists, Delete List Elements, Basic List Operations	06 **hours**	**19 %**
6.	**Functions** Introduction to Annotation, Byte streams and character streams, Wrapper classes , Why Lambda Expression, Lambda Expression Syntax, Where to use lambda expression, Adopting Patterns like matching, finding and filtering,	**02 hours**	**07 %**
7.	**Objects and Classes in Python** Overview of OOP Terminology, Creating Classes, Creating Instance Objects, Destroying Objects, Overriding Methods	**2 hours**	**07 %**
8.	**File I/O** Printing to the Screen, Reading Keyboard Input, Reading and Writing Files	**02 hours**	**07 %**
9.	Use of Libraries: Numpy, Pandas	**06 hours**	**19 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- Faculty deals with concept test as it implies focus on one key concept of learning
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

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

CO1	Applying basic principles and construct of Python programming language
CO2	Developing Problem Solving ability using python programming
CO3	Applying Object Oriented Concepts using python programming
CO4	Implement Statistical Analysis on data and visual representation of information using python programming
CO5	Solve Real World Problems using python programming by project development activities.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO2	-	2	3	2	-	-	-	-	-	-	-	-	2	3
CO3	-	2	3	2	3	2	-	-	-	-	-	-	1	-
CO4	-	2	3	3	-	3	-	-	-	-	-	-	2	3
CO5	-	-	2	2	3	3	-	-	-	2	2	3	3	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

1. Programming Python: Powerful Object-Oriented Programming Fourth Edition by Mark Lutz
2. The Quick Python Book, Second Edition 2nd Editionby Vernon L. Ced

❖ **Reference Books:**

1. Python Essential Reference (4th Edition) 4th Editionby David Beazley

❖ **Web Materials:**

1. Python.org - Official Python site. Find a complete list of all documentation, installation, tutorials, news etc.
2. Web Programming in Python - This topic guide attempts to cover every aspect of programming Web applications (both clients and servers) using Python.

IT346: SUMMER INTERNSHIP-I

Credit and Hours:

Teaching Scheme	Project	Total	Credit
Hours	90	90	3
Marks	150	150	

A. Objective of the Course:

Summer internships are required to be carried out in order to help students to find and know the applications of their theoretical knowledge enhance their company/industry/organization experience, get familiar with the company/industry/organization culture and work ethics.

The main objectives for offering the internship for the students are:

- To get perspective and experience of the field
- To make students company/industry/organization ready
- To get familiar with modern tools and technologies
- To enhance technical writing skills in reporting as per the company/industry/organization standards
- To get involved in design, development and testing practices followed in the company/industry/organization
- To enhance their soft-skills, presentation skills, interpersonal skills, documentation skills and office etiquettes required to sustain in company/industry/organization environment
- To participate in teamwork and preferably as part of a multi-disciplinary team
- To understand the professional and ethical responsibilities of an engineer
- To make them more productive, consistent and punctual
- To make them aware about company/industry/organization best practices, processes and regulations

B. Instructional Method and Pedagogy:

- Summer internship shall be at least 90 hours during the summer vacation only.
- Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
- The student must fill up and get approved a Summer Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline.
- Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed.
- During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and those of the University.
- Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later.
- The student shall submit two documents to the Coordinator for the evaluation of the summer internship:
    - Summer Internship Report
    - Summer Internship Assessment Form
- Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted through the presentation to the Coordinator by the first day of the new term.
- The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester.
- If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.

C. Format of Summer Internship Report:

The report shall comply with the summer internship program principles. Main headings are to be centered and written in capital boldface letters. Sub-titles shall be written in small letters and boldface. The typeface shall be Times New Roman font with 12pt. All the margins shall be 2.5cm. The report shall be submitted in printed form and filed. An electronic copy of the report shall be recorded in a CD and enclosed in the report. Each report shall be bound in a simple wire vinyl file and contain the following sections:

- Cover Page
- Page of Approval and Grading
- Abstract page: An abstract gives the essence of the report (usually less than one page). Abstract is written after the report is completed. It must contain the purpose and scope of internship, the actual work done in the plant, and conclusions arrived at.
- TABLE OF CONTENTS (with the corresponding page numbers)
- LIST OF FIGURES AND TABLES (with the corresponding page numbers)
- DESCRIPTION OF THE COMPANY/INDUSTRY/ORGANISATION: Summarize the work type, administrative structure, number of employees (how many engineers, under which division, etc.), etc. Provide information regarding
    - Location and spread of the company
    - Number of employees, engineers, technicians, administrators in the company
    - Divisions of the company
    - Your group and division
    - Administrative tree (if available)
    - Main functions of the company
    - Customer profile and market share
- INTRODUCTION: In this section, give the purpose of the summer internship, reasons for choosing the location and company, and general information regarding the nature of work you carried out.
- PROBLEM STATEMENT: What is the problem you are solving, and what are the reasons and causes of this problem.

- SOLUTION: In this section, describe what you did and what you observed during the summer internship. It is very important that majority of what you write should be based on what you did and observed that truly belongs to the company/industry/organization.
- CONCLUSIONS: In the last section, summarize the summer internship activities. Present your observations, contributions and intellectual benefits. If this is your second summer internship, compare the first and second summer internships and your preferences.
- REFERENCES: List any source you have used in the document including books, articles and web sites in a consistent format.
- APPENDICES: If you have supplementary material (not appropriate for the main body of the report), you can place them here. These could be schematics, algorithms, drawings, etc. If the document is a datasheet and it can be easily accessed from the internet, then you can refer to it with the appropriate internet link and document number. In this manner you don't have to print it and waste tons of paper.

D. Learning outcomes:

After completion of the course students, will able:

- To apply knowledge and skills learned in company/industry/organization to real-world problems.
- To solve engineering problems.
- To function in a team work.
- To work with teammates from other disciplines.
- To use experience related to professional and ethical issues in the work environment.
- To explain the impact of engineering solutions developed in a project, in a global, economic, environmental, and societal context.
- To finds relevant sources (e.g., library, Internet, experts) and gather information.
- To demonstrate knowledge of contemporary issues related with engineering in general.
- To use new tools and technologies.

E. Student Learning Outcome:

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

CO1	Demonstrate ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
CO2	Cultivate an understanding of their multidisciplinary interest, including the skills, responsibilities and career path of professionals through practice-oriented and 'hands-on' working experience.
CO3	An exhibit foresight, independent thinking, resourcefulness, and the ability to make decisions.
CO4	Develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in an industry.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3	-	-	-	-	-	-	-	-	3	2
CO2	1	2	3	2	-	-	-	-	-	-	-	-	1	1
CO3	1	1	2	-	-	-	-	2	2	3	-	-	2	1
CO4	-	-	-	-	-	-	-	-	-	-	-	-	1	3

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 6)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT355: SOFTWARE ENGINEERING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Software Engineering are:

- To describe the concepts of Software requirements gathering and analyzing, Software design techniques, implementation guidelines,
- To explain CASE tools, design concepts, automated Software Testing, Documentation and Maintenance.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of Hours
1	Introduction to Software and Software Engineering	04
2	Agile Development	06
3	Managing Software Project	05
4	Requirement Analysis and Specification	06
5	Software Design	05
6	Software Coding &Testing	06
7	Quality Assurance and Management	05
8	Software Maintenance and Configuration Management	05
9	Advanced Topics in Software Engineering	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction to Software and Software Engineering**	**04 hours**	**10%**
1.1	The Evolving Role of Software		
1.2	Software Engineering: A Layered Technology		
1.3	Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Spiral Model, Agile Process Model		
1.4	Component-Based Development, Process, Product and Process		
2.	**Agile Development**	**06 hours**	**13%**
2.1	Agility and Agile Process model		
2.2	Introduction to Scrum and Kanban methodology		
2.2	Other process models of Agile Development and Tools		
3	**Managing Software Project**	**05 hours**	**11%**
3.1	Software Metrics (Process, Product and Project Metrics)		
3.2	Software Project Estimations		
3.3	Software Project Planning (MS Project & Visio Tool)		
3.4	Project Scheduling & Tracking(Earn Value Analysis)		
3.5	Risk Analysis & Management(Risk Identification, Risk Projection, Risk Refinement ,Risk Mitigation)		
4	**Requirement Analysis and Specification**	**06 hours**	**13%**
4.1	Understanding the Requirement		
4.2	Requirement Modeling		
4.3	Requirement Specification (SRS)		
4.4	Requirement Analysis and Requirement Elicitation		
4.5	Requirement Engineering		
5	**Software Design**	**05 hours**	**11%**
5.1	Design Concepts and Design Principal		
5.2	Architectural Design		
5.3	Component Level Design (Function Oriented Design, Object Oriented Design) (MS Visio Tool)		
5.4	User Interface Design		
6.	**Software Coding & Testing**	**06 hours**	**13%**
6.1	Testing Strategies		

6.2	Testing Techniques and Test Case, Test Suites Design		
6.3	Testing Conventional Applications		
6.4	Testing Object Oriented Applications		
6.5	Testing Web and Mobile Applications, Testing Tools (Win runner, Load runner)		
7.	**Quality Assurance and Management**	**05 hours**	**11%**
7.1	Quality Concepts and Software Quality Assurance		
7.2	Software Reviews (Formal Technical Reviews)		
7.3	Software Reliability		
7.4	The Quality Standards: ISO 9000, CMM, Six Sigma for SE.		
8.	**Software Maintenance and Configuration Management**	**05 hours**	**11%**
8.1	Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering		
8.1	The SCM Process, Identification of Objects in the Software Configuration		
8.2	Version Control and Change Control		
9.	**Advanced Topics in Software Engineering**	**03 hours**	**7%**
9.1	Component-Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering, Computer-Aided Software Engineering		
9.2	Software Process Improvement		
9.3	Emerging Trends in software Engineering		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Students have to under gone MOOCS Classes by Armando Fox and David Patterson

E. Student Learning Outcome:

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

CO1	Prepare SRS (Software Requirement Specification) document and SPMP (Software Project Management Plan) document.
CO2	Apply the concept of Functional Oriented and Object-Oriented Approach for Software Design.
CO3	Recognize how to ensure the quality of software product, different quality standards and software review techniques.
CO4	Apply various testing techniques and test plan in.
CO5	Able to understand modern Agile Development and Service Oriented Architecture Concept of Industry.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	1	-	-	2	2	3	2
CO2	3	3	3	1	2	1	-	-	-	-	3	2
CO3	3	2	2	2	2	-	-	-	-	2	2	2
CO4	2	3	2	3	-	-	-	-	-	-	2	2
CO5	3	3	3	3	3	-	-	-	-	-	3	2

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions

❖ **Reference Books:**

2. Engineering Software as a Service An Agile Software Approach,Armando Fox and David Patterson
3. Ian Sommerville, Software engineering, Pearson education Asia
4. PankajJalote, An Integrated Approach to Software Engineering by, Springer
5. Rajib Mall, Fundamentals of software Engineering,Prentice Hall of India.
6. John M Nicolas, Project Management for Business, Engineering and Technology,Elsevier

❖ **Web Materials:**

1. www.en.wikipedia.org/wiki/Software_engineering
2. www.win.tue.nl
3. www.rspa.com/spi
4. www.onesmartclick.com/engsineering/software-engineering.html
5. www.sei.cmu.edus
6. https://www.edx.org/school/uc-berkeleyx

IT348: CRYPTOGRAPHY & NETWORK SECURITY

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Cryptography and Network Security are:

- To introduce cryptography theories, algorithms and systems. Necessary approaches and techniques to build protection mechanisms in order to secure computer networks
- To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
- To explore issues surrounding secure key management, random number generation, and the incorporation of cryptography into legacy applications.
- To analyze performance of various cryptographic and cryptanalytic algorithms.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction and Mathematical Foundations	09
2.	Symmetric Key Ciphers	15
3.	Public Key Cryptography	09
4.	Message Authentication and HashFunction	09
5.	Network Security	12
6.	System Security	06

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

C. Detailed Syllabus:

1.	**Introduction and Mathematical Foundations**	**09 hours**	**15 %**
1.1	Security trends – Attacks, Services and Mechanism		
1.2	Conventional Encryption Model, Classical Encryption Techniques, Different types of ciphers, Steganography		
1.3	Basic Number theory—Prime And Relative Prime Numbers, Modular Arithmetic, Congruence ,Fermat and Euler's theorem, Euclid's Algorithm, Chinese Remainder theorem, LFSR sequences , Finite fields.		
2.	**Symmetric Key Ciphers**	**15 hours**	**25 %**
2.1	Simplified Data Encryption Standard, DES, Triple DES		
2.2	Block Cipher Principles,Characteristics Of Advanced Symmetric Block Cipher, Differential And Linear cryptanalysis, Block Cipher Design Principles		
2.3	Advanced Encryption Standard Algorithm,RC4 and RC5		
2.4	Modes of Operation		
2.5	Pseudorandom Number generator and function, Key Distribution		
3.	**Public Key Cryptography**	**09 hours**	**15%**
3.1	Principles Of Public-Key Cryptography		
3.2	RSA Algorithm		
3.3	Key Management		
3.4	ElGamal Algorithm		
3.5	Diffie-Hellman Key Exchange		
4.	**Message Authentication and Hash Function**	**09 hours**	**15 %**
4.1	Authentication Requirement		
4.2	Hash Functions ,Message Authentication Code, Security Of Hash Functions And MAC		
4.3	MD5 Message Digest Algorithm, Secure Hash Algorithm, HMAC		
4.4	Authentication protocols ,Digital Signatures, DSS,		
5.	**Network Security**	**12 hours**	**20%**

5.1	AuthenticationApplications—Kerberos, X.509 Directory Authentication Service,		
5.2	Electronic Mail Security—PGP ,S/MIME		
5.3	IP security —Overview, ESP, AH, Transport and Tunnel mode in IP Sec		
5.4	Web Security— Web Security Requirement, SSL, TLS,SET		
6.	**System Security**	**06 hours**	**10%**
6.1	Intruders, Viruses and Related Threats		
6.2	Firewall Design Principles		
6.3	Trusted Systems		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Course Outcome (COs):

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

CO1	Know the importance of security and to apply the concepts of techniques and methods to implement security mechanism.

CO2	Learn the different encryption and decryption algorithms using symmetric & asymmetric approach to provide confidentiality.
CO3	Implements the aspects of integrity and authentication, like digital signature and message digest, and map them with practical use of it.
CO4	To learn the concepts of web application security, network security and system security for making them immune to attack.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	-	-	-	1	2
CO2	3	3	3	2	3	1	-	-	-	-	-	-	1	1
CO3	2	2	3	2	3	2	-	-	2	1	-	-	1	1
CO4	3	3	3	2	3	-	2	1	2	1	1	2	3	3

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Text Books:**

1. William Stallings, Cryptography And Network Principles And Practice,Prentice Hall, Pearson Education Asia

❖ **Reference Books:**

1. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Companies
2. AtulKahate, Cryptography & Network Security, The McGraw-Hill Companies
3. William Stallings Network Security Essentials: Applications And Standards, Prentice Hall, Pearson Education

❖ **Reference Links/ e-content:**

1. http://people.csail.mit.edu/rivest/crypto-security.html
2. http://www.cryptix.org/
3. http://www.cryptocd.org/
4. http://www.cryptopp.com/

IT354: MACHINE LEARNING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	4	0	8	6
Marks	100	100	0	200	

A. Objective of the Course:

The main objectives for offering the course Artificial Intelligence are:

- To learn about the most effective machine learning techniques, and gain practice implementing them
- To able to effectively use the common neural network "tricks", including initialization, dropout regularization, Batch normalization, gradient checking,
- To understand industry best-practices for building deep learning applications.
- To learn how to quickly and powerfully apply these techniques to new problems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Machine Learning	08
2.	Supervised Learning	16
3.	Neural Networks and Deep Learning	12
4.	Unsupervised Learning	10
5	Model Evaluations	06
6.	Applications and Case Study	08

Total hours (Theory): 60
Total hours (Lab): 60
Total hours: 120

C. Detailed Syllabus:

1. **Introduction to Machine Learning**

   Need for Machine Learning, Basic principles, Applications, Challenges, Types of Machine Leaning: Supervised Learning, Unsupervised Learning, Reinforcement Learning — **08 Hours** **13 %**

2.	**Supervised Learning** Linear Regression, Logistic Regression, K Nearest Neighbours, Overfitting and Regularization, Support Vector Machines.	**16 Hours**	**27 %**
3.	**Neural Networks and Deep Learning** Perceptron Learning, Network Overview, Neural Network Representation, Need for Non-Linear Activation Functions, Cost Function, Back propagation, Training & Validation, Need for Deep representations, Building blocks of Deep Neural Networks, CNN	**12 Hours**	**20 %**
4.	**Model Evaluations** Training Testing sets, Learning Curves, Confusion Matrix, Gain and Lift Chart, Root Mean Squared Error, Cross Validation, ROC curves	**10 Hours**	**17%**
5.	**Unsupervised Learning** K-Means Clustering, Hierarchical Clustering, Association Rule Learning, Dimensionality Reduction (PCA, SVD)	**06 Hours**	**10%**
6.	**Applications and Case Study** Machine Learning Applications Across Industries (Healthcare, Retail, Financial Services, Manufacturing, Hospitality) ML offerings AI Startups (Tips, Tricks, Definitions)	**08 Hours**	**13%**

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

CO1	To solve difficult and complex problem of computer science using AI techniques.
CO2	To select any R&D field related to application of AI.
CO3	To understand soft computing and machine learning courses.
CO4	To develop software solution as per need of today's IT edge which requires high automation and less human intervention.
CO5	To demonstrate working knowledge in Python in order to write and explore more sophisticated Python programs
CO6	To apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	-	-	-	-	-	-	-	2	2
CO2	3	2	-	3	1	1	-	-	-	-	-	1	1	1
CO3	-	-	-	-	3	-	-	-	-	-	-	3	2	-
CO4	3	3	3	-	1	1	1	-	-	-	-	1	3	2
CO5	2	3	3	1	2	-	-	-	-	-	-	3	3	1
CO6	-	-	-	-	2	3	3	-	-	-	-	2	1	3

G. Recommended Study Material:

- **Text Books:**
  1. Machine Learning, Tom Mitchell, McGraw Hill, 1997. ISBN 0070428077
  2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004
- **Reference Books:**
  3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
  4. Richard O. Duda, Peter E. Hart & David G. Stork, "Pattern Classification. Second Edition", Wiley & Sons, 2001.
  5. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The elements of statistical learning", Springer, 2001.
  6. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", MIT Press, 1998.
- **Web Materials:**
  1. https://www.youtube.com/watch?v=fgtUFzxNztA
  2. http://nptel.iitm.ac.in/video.php?courseId=1041
  3. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html
  4. http://www.webopedia.com/TERM/A/artificial_intelligence.html
  5. http://en.wikipedia.org/wiki/Artificial_intelligence

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	100	-	200	

A. Objective of the Course:

The main objectives for offering the course Wireless Communication & Mobile Computing are:

- To learn the basics of Wireless voice and data communications technologies.
- To build knowledge on various Mobile Computing algorithms.
- To study the working principles of wireless LAN and its standards.
- To build skills in working with Wireless application Protocols to develop mobile content applications.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Wireless Communication Fundamentals	03
2.	Telecommunication Network	12
3.	Wireless LAN	10
4.	Mobile Network Layer	11
5.	Transport and Application Layer	9

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Wireless Communication Fundamentals**	**03 hours**	**10 %**
1.1	Introduction		
1.2	Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation		
1.3	Multiplexing – Modulations – Spread spectrum		
1.4	MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks		
2.	**Telecommunication Network**	**12 hours**	**25 %**
2.1	Telecommunication systems Overview – GSM – GPRS – DECT – UMTS – Satellite Networks		
2.2	GSM		
2.3	GPRS		
2.4	CDMA		
3.	**Wireless LAN**	**10 hours**	**30 %**
3.1	Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer		
3.2	IEEE 802.11a - 802.11b – 802.11n standards		
3.3	Bluetooth		
3.4	Hyperlan, Wi-Fi, WiMax - Overview		
4.	**Mobile Network Layer**	**11 hours**	**20 %**
4.1	Mobile IP		
4.2	Dynamic Host Configuration Protocol		
4.3	Routing Protocols – DSDV – DSR – Alternative Metrics.		
5.	**Transport and Application Layer**	**09 hours**	**12 %**
5.1	Traditional TCP		
5.2	Classical TCP improvements – WAP, WAP 2.0		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will learn the fundamentals of Wireless communication and WLAN standards.
- Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.

F. Recommended Study Material:

❖ **Text Books:**

1. "Mobile Computing: Technology, Applications and Service Creation" by Asoke K Talukder and Roopa R Yavagal, TMH,ISBM: 0-07-058807-4

❖ **Reference Materials:**

2. Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition, 2003.

3. William Stallings, "Wireless Communications and Networks", PHI/Pearson Education, 2002.
4. KavehPahlavan, PrasanthKrishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.
5. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
6. Hazysztof Wesolowshi, "Mobile CommunicationSystems", John Wiley and Sons Ltd, 2002
7. Research papers from IEEE, Springer etc.

❖ **Web links:**

1. www.ietf.org – For drafts
2. www.ieee.org – For standards and technical research papers

Course Outcome (COs):

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

CO1	Students will learn the fundamentals of Wireless communication and WLAN standards.
CO2	Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.
CO3	Students will gain the knowledge of traditional concepts of mobile communication.
CO4	Wireless LAN basics and Hyperlan will be added to the knowledge into the students.
CO5	Students will be able to understand 3G, 4G, 5G technologies.
CO6	Students will be able to study the Concept of Bluetooth, working of application layer and transport layer of wireless communication and apply it in real-world application.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	3	-	-	-	-	-	-	-	2	-	-
CO2	-	-	2	-	-	-	-	-	2		-	-	-	2	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT349	2.50	2.00	2.00	3.00	2.50	-	-	-	2.00	-	-	-	2.00	2.00	-

IT379: COMPUTER VISION (Elective – II)

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course are:

- To provide the knowledge of image processing techniques and applications of computer vision algorithms.
- To introduce students the fundamentals of image formation
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition
- To develop an appreciation for various issues in the design of computer vision and object recognition systems; and
- To provide the student with programming experience from implementing computer vision and object recognition applications.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction and Foundations	05
2.	Digital Image Formation and low-level processing	04
3.	Depth estimation and multi-camera views	03
4.	Feature Extraction, Image Segmentation and Pattern Analysis	10
5.	Shape Representation and Segmentation	07
6.	Hough Transform and Object recognition	07
7.	3D Vision and Motion	05
8.	Applications	04
	Total hours (Theory):	**45**
	Total hours (Lab):	**30**
	Total hours:	**75**

C. Detailed Syllabus:

Unit No.	Topics	Teaching Hours
1	Introduction and Foundations Image Processing, Computer Vision and Computer Graphics, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality	5
2	Digital Image Formation and low-level processing Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.	4
3	Depth estimation and multi-camera views Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel.	3
4	Feature Extraction, Image Segmentation and Pattern Analysis Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT, Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection, Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.	10
5	Shape Representation and Segmentation Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis	7

Unit No.	Topics	Teaching Hours
6	Hough Transform and Object recognition Line detection, Hough Transform (HT) for line detection, foot-of-normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection, accurate center location, speed problem, ellipse detection, Case study: Human Iris location, hole detection, generalized Hough Transform (GHT), spatial matched filtering, GHT for ellipse detection, object location, GHT for feature collation, Object Recognition: Simple object recognition methods, Shape correspondence and shape matching, Principal component analysis , Shape priors for recognition.	7
7	3D Vision and Motion Methods for 3D vision, projection schemes, shape from shading, photometric stereo, shape from texture, shape from focus, active range finding, surface representations, point-based representation, volumetric representations, 3D object recognition, 3D reconstruction, introduction to motion, triangulation, bundle adjustment, translational alignment, parametric motion, spline-based motion, optical flow, layered motion.	5
8	Applications Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground-background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians.	4
	Total	**45**

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

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

CO1	Understand image processing techniques for computer vision.
CO2	Understand image formation techniques, extract features from image and do analysis of image.
CO3	Understand shape and region analysis.
CO4	Understand Hough transformation and its application to detect ellipse, line.
CO5	Understand three-dimensional analysis techniques.
CO6	Develop some application using computer vision algorithms.

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	3	3	2	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	-	-	3	3	-	-	-	-	-	-	-	3	3
CO6	-	-	3	-	3	-	-	-	-	-	-	-	3	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. **Recommended Study Material:**

❖ **Text book:**

1. **Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.**
2. **Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.**

❖ **Reference Books:**

1. 1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. 2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. 3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992.
4. 4. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.

5. 5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010
6. 6. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
7. 7. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
8. 8. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
9. 9. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

❖ Journals

1. IEEE-T-PAMI (IEEE Transactions on Pattern Analysis and Machine Intelligence).
2. IJCV (International Journal of Computer Vision) - Springer.

IT380 CYBER SECURITY (Elective – II)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course are:

- To learn basic concepts of cybersecurity.
- To learn basic concepts of cybersecurity risk.
- To learn & implement security methodologies to secure various devices.
- To learn various cybersecurity laws and latest trends.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Introduction to Cybersecurity	10
2.	Cybersecurity Risks and various Frameworks	14
3.	Information Security Overview	14
4.	Cyber Security Laws & Latest Trends	07

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

D. Detailed Syllabus:

1.	**Introduction to Cybersecurity:** Importance of Information Security, Importance of Physical Security and Password, Penetration Testing, Cybersecurity Definitions, Importance of Cybersecurity and Terminology, Demystifying Computers, Demystifying the Internet, Passwords, Hash Function, Common Password Threats, The working of Email & Email Security, Malware, Functions of Malware, Sources of Malware, Layers of Defense Against Malware, The working of Web Browsing, Safely Navigating the Web and Online Shopping, Wireless Network, Security Threats, Public Networks, Social Media and Privacy, Social Engineering, Interpersonal Issues Online	**10 hours**	**22 %**
2.	**Cybersecurity Risks and various Frameworks** National Institute of Standards and Technology (NIST) Cybersecurity Risks, Risk Management Framework, Framework for Improving Critical Infrastructure Cybersecurity	**14 hours**	**31 %**
3.	**Information Security Overview** Hacking concepts, Footprinting and Reconnaissance, Scanning Networks, Enumeration, Understanding Computer Forensics, Various forensic investigations challenges	**14 hours**	**31 %**
4.	**Cyber Security Laws & Latest Trends** Cyber Laws in India, Information Technology Acts and Cybercrimes case studies, Internet Privacy with Proxies, VPNs and Tor, latest trends of cybersecurity	**07 hours**	**16 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board etc.
- Attendance is compulsory in lectures and laboratory.

- Marks will be given based on continues evaluation, i.e. Unit Tests/Surprise tests/Quizzes/Seminar and Assignments based on course content will be given to the students at the end of each unit/topic.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Course Outcome (COs):

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

CO1	To learn basic concepts of cybersecurity.
CO2	To learn basic concepts of cybersecurity risk.
CO3	To learn & implement security methodologies to secure various devices.
CO4	To learn various cybersecurity laws and latest trends.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	3	-	3	-	-	-	3	-	-
CO2	3	2	2	2	1	2	-	3	2	-	1	3	1	2
CO3	3	3	3	3	3	1	-	3	3	-	-	3	3	3
CO4	3	1	-	1	3	3	1	3	-	-	-	3	2	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

2. Charles J. Brooks., "Cybersecurity Essential", Sybex, 2018
3. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India

❖ **Reference Books:**

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" , Princeton University Press
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH," Cyber Laws And It Protection " , PHI Learning Private Limited ,Delhi ,India

❖ **Reference Links/ e-content:**

1. NIST Cybersecurity Framework: https://www.nist.gov/cyberframework
2. Cybersecurity Risk: https://www.nist.gov/itl/smallbusinesscyber/cybersecurity-basics/cybersecurity-risks
3. Risk Management Framework: https://www.nist.gov/cyberframework/risk-management-framework
4. Framework for Improving Critical Infrastructure Cybersecurity: https://nvlpubs.nist.gov/nistpubs/CSWP/NIST.CSWP.04162018.pdf

Credit and Hours:

Teaching Scheme	Theory	Practical	Project	Total	Credit
Hours/week	0	0	4	4	2
Marks	0	0	100	100	

A. Objective of the Course:

The main objective of the course is:

- To increase awareness and enhance knowledge of students in developing software projects compatible with industry standard, technology and latest development in field of Computer and IT.
- To apply various tools in software development life cycle.

B. Outline of the Course:

Sr. No.	Title	Minimum Number of Hours
1	Software Project Planning and Tracking tools	20
2	Software Designing Tools	20
3	Software Testing Tools	20

Total hours (Theory): 00
Total hours (Lab): 60
Total hours: 60

C. Detailed Syllabus:

1. Software Project Planning and Tracking Tools **20 Hours**

1.1 Pert Chart, Gantt Chart, MS Project and Visio

1.2 Primavera for project tracking

2 Software Project Designing Tools **20 Hours**

2.1 MS Visio, Rational Rose, Edraw Max

3 Software Testing Tools **20 Hours**

3.1 Win runner, HP Load Runner

D. Instructional Method and Pedagogy:

- Project Groups would be form of maximum two students.
- Inter batch group formation is not permitted due to difficulties in progress tracking.
- Students are advised to choose innovative and challenging definitions.
- Batch wise project definitions must be unique.
- Project based on Web development, E-commerce etc. are restricted. As they would be covered as part of curriculum in other courses.
- Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
- Student has to prepare report at end of semester as part of submission.
- Report structure is finalized for semester end submission.
- To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
- To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check (iThenticate/ Turnitin report) before 15 days of external exam.
- Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
- Students have to bring internal review card hard copy on the day of internal review exam, after that they will attach filled review card in their final project report.

E. Student Learning Outcome:

After the completion of the course students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.

CO5	Solve communication issues in large, complex software projects and Structure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Reference book:**

13. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
14. Sanjay Mohapatra, Software Project Management, Cengage Learning
15. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, "Engineering Design – A Project Based Introduction", Wiley India Pvt. Ltd.
16. B. Hughes & M. Cotterell, "Software Project Management", Tata Mcgraw Hills.

❖ **Web Materials:**

22. https://status.net/templates/project-report/
23. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
24. https://www.geeksforgeeks.org/coding-standards-and-guidelines/

25. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
26. https://nptel.ac.in/courses/106/105/106105218/
27. https://www.youtube.com/watch?v=T3q6QcCQZQg
28. https://www.scribbr.com/category/research-paper/

SYLLABI

(Semester – 7)

CHAROTARUNIVERSITY OF SCIENCE AND TECHNOLOGY

IT441: DATA SCIENCE

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. An objective of the Course:

The main objectives for offering the course Data Science are:

- To introduce students to basic applications, concepts, and techniques of data Warehousing & mining
- Understand the fundamental processes, concepts and techniques of data mining and develop an appreciation for the inherent complexity of the data-mining task.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.
- To gain experience doing independent study and research.

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B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction	06
2.	Data Pre-processing	12
3.	Data Warehouse & OLAP Technology	10
4.	Data Visualization	08
5.	Decision Tree & Random Forest	05
6.	Application of Data Science in Real World	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction**	**06 hours**	**13.33 %**
1.1	Defining data science, Defining data science by its key components		
1.2	Exploring Data Engineering Pipelines and Infrastructure - Defining big data, Looking at some sources of big data, Distinguishing between data science and data engineering,		
1.3	Boiling Down Data with MapReduce and Hadoop, Identifying Alternative Big Data Solutions		
1.4	Seeing the benefits of business-centric data science, Incorporating Data-Driven Insights into the Business Process		
1.5	Distinguishing Business Intelligence and Data Science, Exploring Data Science in Business		
2.	**Data Pre-processing**	**12 hours**	**20 %**
2.1	Importance of Pre-processing the Data		
2.2	Data Cleaning		
2.3	Data Integration and Transformation		
2.4	Data Reduction		
2.5	Data Discretization and Concept Hierarchy Generation		
3.	**Data Warehouse and OLAP Technology**	**10 hours**	**16.64 %**
3.1	Introduction to Data Warehouse		
3.2	A Multidimensional Data Model		
3.3	Data Warehouse Architecture		
3.4	From Data Warehousing to Data Mining		
4.	**Data Visualization**	**08 hours**	**16.64 %**
4.1	Perfect type of data visualization		
4.2	Picking the right design style		
5.	**Decision Tree & Random Forest**	**05 hours**	**23.33 %**
5.1	Other Classification Methods		
5.2	Prediction		

5.3	Evaluating the Accuracy of a Classifier		
6.	**Application of Data Science in Real World**	**04 hours**	10.06 %
6.1	Application of data science in the field of Telecommunication		
6.2	Application of data science in the field of Energy		
6.3	Application of data science in the field of government		
6.4	Application of data science in the field of healthcare		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and an average of the same will be converted to the equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

CO1	Students will able to understand important of data mining and its various concepts like data preprocessing, various classification algorithms etc.
CO1	A student will be able to develop a reasonably sophisticated data mining application.

CO1	A student is able to select methods and techniques appropriate for the task
CO1	A student is able to develop the methods and tools for the given task

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	2	2
CO2	2	2	2	-	1	-	-	-	-	1	-	1	2	3
CO3	1	1	3	-	3	-	-	-	-	-	-	3	2	1
CO4	1	1	3	-	3	-	-	-	-	-	-	3	2	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Text Books:**
  1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
  2. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
- **Reference Books:**
  3. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
  4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
  5. Pieter Adriaans, Dolf Zantinge, "Data Mining", Pearson Education Asia
- **Web Links:**
  1. http://www.dataminingblog.com
  2. http://www.kdnuggest.com

IT442: ADVANCED COMPUTING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Advanced Computing are:

- To provide an overview of the basic concepts of cluster computing, grid computing and cloud computing.
- To highlight the advantage of deploying cluster computing and cloud computing.
- To illustrate the practical adoption of a cloud and cluster deployment through real life case studies.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamentals of Distributed Computing	06
2.	Understanding Cloud Computing Concepts	06
3.	Cloud Enabling Technologies	05
4.	Cloud Services Providers	04
5.	Understanding and Implementing Cloud Securities	04
6.	Cloud Computing : Cost Metrics ,QoS and SLA	04
8.	Fundamentals of Container Technology & Tools	08
9.	Fundamentals of Micro services and Automation Tools	08

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Fundamentals Distributed Computing**	**06 hours**	**14 %**
1.1	History of Computing , Elements of Distributed Computing, Parallel Computing		
1.2	Scalable Parallel Computer Architecture, Symmetric Multi-Processor		
1.3	Cluster Computing , Architecture and Applications		
1.4	Load Balancing in Cluster Computing.		
1.5	Resource Management and Scheduling in Cluster Computing		
1.6	Programming Environments and Tools : Cluster Computing		
1.7	Setting up the Cluster , Monitor & security		
1.8	Implementing RPC and Web-services		
1.9	Grid Computing and Architecture		
2.	**Understanding Cloud Computing Concepts**	**06 hours**	**14 %**
2.1	History of cloud computing,		
2.2	Technology Innovations: Clustering, Grid ,Utility & Virtualization		
2.3	Cloud characteristics		
2.4	Cloud delivery Models & Deployment Models		
2.5	Cloud Storage , Virtual Private Cloud		
2.6	Challenges of Cloud Computing		
3.	**Cloud Enabling Technologies**	**05 hours**	**12 %**
3.1	Data Center Technology		
3.2	Virtualization Technology		
3.3	Case Study of Cloud Enabling Technologies		
4.	**Cloud Services Providers**	**04 hours**	**10 %**
4.1	Deploying and Accessing cloud services		
4.2	Securing Cloud Services		
4.3	Comparing Cloud Service Providers		
4.4	Amazon Web services, Google Cloud Platform ,		
4.5	Microsoft Azure, Salesforce etc.		

5.	**Understanding and Implementing Cloud Securities**	**04 hours**	**10 %**
5.1	Basic Terms: Confidentiality , Integrity, authenticity, Availability, Risk, Threat		
5.2	Cloud Security Threats		
5.3	Cloud Security Mechanisms		
5.4	Case Studies: AWS (Cloud Security)		
6.	**Cloud Computing : Cost Metrics ,QoS and SLA**	**04 hours**	**08%**
6.1	Cost Metrics : Network, Computing , Storage		
6.2	QoS(Quality of Service) and QoS Metrics , SLA (Service Level Agreement)		
7.	**Fundamentals of Container Technology & Tools**	**08 hours**	**16 %**
7.1	Understanding Basic Terms : Cgroups, Namespace, Layered File System etc.		
7.2	Understanding & Implementing Container.		
7.3	Virtual Machine vs Containers		
7.4	Pros and Cons of Container Technology		
7.5	Fundamentals of Docker.		
7.6	Docker networking and storage		
7.7	Docker Compose		
7.8	Introduction to Container Orchestration and Tool: Kubernets		
8.	**Fundamentals of Micro services and Automation Tools**	**08 hours**	**16 %**
8.1	Introduction to Micro Services and need of Micro Services		
8.2	Micro Services Architecture and Concepts/Components		
8.3	Pros and Cons/Challenges and Applications of Micro Services		
8.4	Introduction to DevOps and CI/CD		
8.5	Introduction to Ansible : Infrastructure/Platform Automation		
8.6	Introduction to Jenkins : CI/CD Automation		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. **Course Outcome (COs):**

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

CO1	Understand and explain the concept of Grid, Cluster and Cloud Computing.
CO2	Prepare for any upcoming deployments of Grid or Cluster and be able to get started with a potentially available Grid or Cluster setup.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	3	-	-	-	1	-	1	2	3	3
CO2	2	3	3	1	3	-	-	-	1	-	2	3	3	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Text Books:**
  1. Erl, Thomas, Ricardo Puttini, and Zaigham Mahmood. Cloud computing: concepts, technology & architecture. Pearson Education, 2013.
  2. JUDITH, S. HURWITZ. CLOUD COMPUTING FOR DUMMIES. JOHN WILEY & Sons, 2019.
  3. Mastering Cloud Computing. Rajkumar Buya.
- **Reference Books:**
  4. Ronald Krutz, Cloud Security, Wiley India.
  5. Bernard Golden, Virualization for Dummies, Wiley India.
- **Web Materials:**
  1. www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf

IT443: LANGUAGE PROCESSOR

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Language Processor are:

- To study Language processor and language processing activities.
- To explore design and implement lexical analyzer and parser.
- To explore, design code generation schemes.
- To explore optimization of codes.
- To learn the assembly language processing

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Language Processor	04
2.	Macros and Macro Preprocessors	04
3.	Finite Automata and Grammar	14
4.	Analysis Phase of Compiler	20
5.	Synthesis Phase of Compiler	10
6.	Assemblers	08

Total hours (Theory): 60 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 90 Hrs.

C. Detailed Syllabus:

1.	**Introduction to Language Processor**	**04 hours**	**05 %**
1.1	Introduction		
1.2	Language processing activities		
1.3	Fundamental of language processing		
1.4	Fundamental of language Specification		
1.5	Introduction to preprocessor, compiler and assembler		
2.	**Macros and Macro Preprocessors**	**04 hours**	**05 %**
2.1	Macro definition and call		
2.2	Macro Expansion, Nested Macro Calls		
2.3	Design of macro preprocessor		
3.	**Finite Automata and Grammar**	**14 Hours**	**25 %**
3.1	Basic Definition, Regular Expression, Regular Language, Finite Automata : NFA and DFA		
3.2	Non Determinism Finite Automata, Conversion from NFA to DFA		
3.3	∧- Non Determinism Finite Automata, Conversion of NFA-∧ to NFA		
3.4	Minimization of DFA		
3.5	Introduction to Grammar, Types of Grammars		
3.6	Context Free Grammars, Derivations and Languages, Relationship between derivation and derivation trees		
3.7	Ambiguity Unambiguous CFG and Algebraic Expressions Bacos Naur Form (BNF), Normal Form – CNF, GNF		
4.	**Analysis Phase of Compiler**	**20 hours**	**40 %**
4.1	Introduction to Lexical analysis, Role of the lexical analyzer		
4.2	Specification of tokens, Recognition of tokens		
4.3	Lexical analyzer generators		
4.4	Role of the parser		
4.5	Top-down parsing, Bottom- up parsing		

4.6	Syntax-Directed Definitions		
4.7	Bottom-Up Evaluation of S-Attributed Definitions and L-Attributed Definitions		
4.8	Top Down Translation and Bottom-Up Evaluation of Inherited Attributes		
5.	**Synthesis Phase of Compiler**	**10 hours**	**15 %**
5.1	Intermediate Languages, Declarations, Assignment Statements, Intermediate code generation techniques		
5.2	The Principal Sources of Optimization		
5.3	Machine Independent and machine dependent code optimization techniques		
5.4	Issues in the Design of a Code Generator		
6.	**Assemblers**	**08 hours**	**10 %**
6.1	Elements of assembly language programming		
6.2	Overview of the assembly process		
6.3	A simple Assembly Scheme		
6.4	Design of two pass assembler		

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

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

CO1	Analyze the functionalities of language processors.
CO2	Simulate Compilation process using tools such as LEX and YACC.
CO3	Analyze and generate the different parsing techniques.
CO4	Perform optimization at different level of program.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	3	-	-	-	-	-	-	-	3	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	1
CO3	2	3	2	2	-	-	-	-	-	-	-	-	3	2
CO4	3	3	2	3	-	-	-	-	-	-	-	-	3	2

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Text Books:**
  1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia.
  2. D. M. Dhamdhere, "System Programming and Operating Systems", Tata McGraw-Hill.
  3. John c martin, "Introduction to Languages and the Theory of Computation", The McGraw -Hill.
- **Reference Books:**
  4. Allen I. Holub "Compiler Design in C", Prentice Hall of India.
  5. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings.
  6. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill

7. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI.
8. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.
9. Compiler Construction by Kenneth. C. Louden, Vikas Pub.

❖ **Web Materials:**

1. http://compilers.iecc.com/crenshaw
2. http://www.compilerconnection.com
3. http://dinosaur.compilertools.net
4. http://pltplp.net/lex-yacc

IT444: INTERNET OF THINGS

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Internet of Things (IoT) are:

- Have built a couple of applications that will communicate with IoT hardware and software
- Have researched a specific IoT domain and provided insight on current work
- Be able to explain how IoT, cloud computing and big data analytics can work together
- Be able to evaluate an IoT offering in terms of IoT levels and Protocols

B. Outline of the Course:

Sr No.	Title of the unit	Minimum Number of Hours
1.	Introduction of IoT	05
2.	IoT Architecture and Protocols	12
3.	Enabling Technologies	10
4.	Emerging Challenges	10
5.	Opportunities for the Developing World	06
6.	IoT Tools and Data Analytics	02

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1.	**Introduction of IoT**	**05 Hours**	**11 %**
1.1	Introduction		
1.2	Towards ubiquity		
1.3	A question of vision		
1.4	Why the Internet of Things is important		
1.5	M2M Vs. IoT		
2.	**IoT Architecture and Protocols**	**12 Hours**	**27%**
2.1	IoT Protocols, Network Layers of IoT Architecture		
2.2	IoT Threats, Security in IoT/M2M, Privacy		
2.3	Proposed IoT/M2M Security Framework		
3.	**Enabling Technologies**	**10 Hours**	**22 %**
3.1	Introduction		
3.2	Tagging things: RFID		
3.3	Feeling things: Sensor technologies, Thinking things: Smart technologies, Shrinking things: Nanotechnology		
4.	**Emerging Challenges**	**10 Hours**	**22 %**
4.1	Introduction		
4.2	Standardization and harmonization		
4.3	Privacy implications		
4.4	Socio-ethical considerations		
5.	**Opportunities for the Developing World**	**06 Hours**	**13 %**
5.1	Introduction		
5.2	Developing economies as users and innovators		
5.3	Space for the state in enabling the Internet of Things		
5.4	Common development goals and the World Summit on the Information Society		
6.	**IoT Tools and Data Analytics**	**02 Hours**	**05 %**
6.1	Tools in IoT, Data Analytics in IoT, IoT Physical Systems		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

CO1	Understand the basic concepts Internet of Things and how to integrate enabling technologies
CO2	Correlate IoT protocol stack with security and privacy issues
CO3	Applying concepts to integrate IoT with other thrust areas like Big Data, Cloud, Block chain etc.
CO4	Integration of Existing technology for development of IoT Smart Applications

Course Articulation Matrix

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	1	-	-	-	-	-	-	-	2	2
CO2	2	1	-	-	1	-	-	2	-	-	-	-	1	1
CO3	2	2	3	2	2	-	-	-	-	-	-	-	3	2
CO4	3	3	3	3	3	-	2	-	3	1	1	1	3	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

1. "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Ovidiu Vermesan, Peter Friess, River Publishers.

❖ **Reference Books:**

2. Internet of Things: A hands on approach by Arshdeep Bahga and Vijay Madisetti.
3. Research papers from IEEE, Springer etc.
4. The Internet of Things-ITU.

❖ **Web Materials:**

1. http://www.vs.inf.ethz.ch/res/show.html?what=iot_ – For Research Papers
2. www.ieee.org – For standards and technical research papers

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objective to give the course

- Discuss the motivation for the typical network hierarchy of access networks, distribution networks, and core networks.
- Understand the differences between the five generations of cellular networks.
- Present an overview of the major categories of packet traffic on the internet including elastic, inelastic and real-time traffic.
- Explain the concept of QoS and QoE.
- Understand the essential elements of routing.
- List and explain the key requirements for and SDN architecture.
- Explain the significance of northbound and southbound APIs.
- Understand the concepts of an OpenFlow logical network device.
- Understand the concept of flowtable.
- Discuss the routing function in the SDN controller.
- Understand importance of SDN application plane.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Elements of Modern Networking	07
2	Requirements and Technology	**10**
3	SDN: Background and Motivation	**10**
4	SDN Data Plane and OpenFlow	**05**
5	SDN Control Plane&SDN Application Plane	**13**

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	Elements of Modern Networking	**07 Hours**	**16%**

The Networking Ecosystem, Example Network Architectures, Ethernet, Wi-Fi, 4G/5G Cellular, Network Convergence, Unified Communications

2.	Requirements and Technology	**10 Hours**	**22%**

Types of Network and Internet Traffic, Demand: Big Data, Cloud Computing, and Mobile Traffic, Requirements: QoS and QoE, Routing, Congestion Control, SDN and NFV, Modern Networking Elements

3.	SDN: Background and Motivation	**10 Hours**	**22%**

Evolving Network Requirements, The SDN Approach, SDN- and NFV-Related Standards

4.	SDN Data Plane and OpenFlow	**05 Hours**	**11%**

SDN Data Plane, OpenFlow Logical Network Device, OpenFlow Protocol

5.	SDN Control Plane&SDN Application Plane	**13 Hours**	**29%**

SDN Control Plane Architecture, ITU-T Model, OpenDaylight, REST, Cooperation and Coordination Among Controllers, SDN Application Plane Architecture, Network Services Abstraction Layer, Traffic Engineering, Measurement and Monitoring, Security, Data Center Networking, Mobility and Wireless, Information-Centric Networking

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Minimum 5 experiments shall be there in the laboratory related to course contents.
- Research / technical papers in relevant areas must be covered.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

E. Student Learning Outcomes:

By taking this course,

- Students will be able to differentiate between traditional network and software defined network.
- Student will learn QoS(Quality of service) is termed into QoE(Quality of Experience).
- Students will know requirement of Control plane and Data plane.
- Students will know measurements and monitoring of network using SDN.

F. Recommended Study Material:

❖ **Text Books:**

1. William Stallings, Florence Agboma, Sofiene Jelassi "Foundations of Modern Networking, SDN, NFV, QoE, IoT, and Cloud"; Pearson Publisher, ISBN-13: 978-0-13-417539-3
2. Behrouz A. Forouzan, "TCP/IP Protocol Suite.", Fourth Reprint, 2003;Tata McGraw Hill ISBN: 0-07-049551-3

❖ **Reference Books:**

1. Douglas E. Comer and David L. Stevens, "Internetworking with TCP/IP Volume-2, Design, Implementation and Internals ", Prentice Hall

❖ **Web Materials:**

1. https://www.sdxcentral.com/
2. https://sdn.ieee.org/standardization
3. https://trac.ietf.org/trac/irtf/wiki/sdnrg
4. https://www.opennetworking.org/sdn-resources/openflow
5. https://www.opendaylight.org/
6. https://www.opennetworking.org/

E. Student Learning Outcome:

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

CO1	Explain and discuss the basic concepts and architecture of SDN
CO2	Compare and contrast conventional networking approaches and SDN
CO3	Evaluate the pros and cons of applying SDN in WAN and data centers
CO4	Analyse and apply implementation of SDN through Open Flow Switches
CO5	Implement, troubleshoot and debug SDNs through hands on illustrations

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3	2	2	-	-	-	1	-	2	-	2	2
CO2	1	2	2	2	1	-	-	-	-	-	-	-	1	-
CO3	-	1	1	1	-	-	-	-	-	-	-	-	1	1
CO4	1	2	1	2	-	-	-	-	-	-	-	-	-	1
CO5	1	2	2	3	-	-	-	-	2	-	-	-	1	2

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	150	

A. Objective of the Course:

The main objectives for offering the course Artificial Intelligence are:

- To learn about the most effective AI techniques, and gain practice implementing them
- To able to effectively use the common planning, reasoning, logic "tricks".
- To understand industry best-practices for building AI applications.
- To learn how to quickly and powerfully apply these techniques to new problems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to AI, Problems and Search, Heuristic Techniques	10
2.	Logic in Intelligent System	10
3.	Knowledge Representation	06
4.	Learning	07
5.	Uncertainty	06
6.	Planning and Advanced Topics	06

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Introduction to AI, Problems and Search, Heuristic Techniques** Problem representation; State Space Search; A* Algorithm and its Properties; AO* search, Minimax and alpha-beta pruning, AI in games.	**10 Hours**	**22%**
2.	**Logic in Intelligent System** Predicate Logic & Propositional Logic, Resolution, Formal Systems; Notion of Proof, Decidability, Soundness, Consistency and Completeness; Predicate Calculus (PC), Resolution Refutation.	**10 Hours**	**22%**
3.	**Knowledge Representation** PC based Knowledge Representation, Intelligent Question Answering, Semantic Net, Frames, Script, Conceptual Dependency, Ontologies, Basics of Semantic Web.	**06 Hours**	**13%**
4.	**Learning** Learning from Examples, Decision Trees, Neural Nets, Hidden Markov Models, Reinforcement Learning, and Learnability Theory.	**07 Hours**	**16%**
5.	**Uncertainty** Formal and Empirical approaches including Bayesian Theory, Fuzzy Logic, Non-monotonic Logic, Default Reasoning.	**06 Hours**	**13%**
6.	**Planning and Advanced Topics** **Planning:** Blocks World, STRIPS, Constraint Satisfaction, Basics of Probabilistic Planning. **Advanced Topics:** Introduction to topics like Computer Vision, Expert Systems, Natural Language Processing, Big data, Neuro Computing, Robotics, Web Search.	**06 Hours**	**14%**

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.

- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

CO1	To solve difficult and complex problem of computer science using AI techniques.
CO2	To select any R&D field related to application of AI.
CO3	To understand soft computing and machine learning courses.
CO4	To develop software solution as per need of today's IT edge which requires high automation and less human intervention.
CO5	To demonstrate working knowledge in Python in order to write and explore more sophisticated Python programs
CO6	To apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12
CO1	3	2	3	2	2	-	-	-	-	-	3	2
CO2	2	2	2	3	2	-	-	-	-	-	3	1

CO3	3	3	3	3	2	-	-	-	-	-	3	2
CO4	2	2	2	1	2	-	-	-	-	-	3	2
CO5	3	2	2	3	3	-	-	-	-	2	2	2
CO6	2	2	2	3	3	-	-	-	-	-	3	2

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

H. Recommended Study Material:

❖ **Text Books:**

1. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd edition, Pearson, 2010.
2. Elaine Rich & Kevin Knight, "Artificial Intelligence", McGraw-Hill Science/Engineering/Math; 2nd edition

❖ **Reference Books:**

1. Nilsson, N.J., "Artificial Intelligence, a New Approach", Morgan Kaufmann, 2000.
2. Mitchell, T., "Machine Learning", McGraw-Hill, 1997.

❖ **Papers:**

1. Journals: Artificial Intelligence, Artificial Intelligence Programming, Machine Learning, IEEE Expert, Data and Knowledge Engineering, Pattern Recognition etc.
1. Conferences: AAAI, IJCAI, UAI, ICML, ACL etc.

❖ **Web Materials:**

1. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html
2. http://www.webopedia.com/TERM/A/artificial_intelligence.html

IT474 BLOCKCHAIN TECHNOLOGIES (Elective – III)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course are:

- To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
- To learn basic concepts of Blockchain & various Cryptocurrencies.
- To learn & implement Ethereum, Smart Contracts & Permissioned Blockchain, hyper ledger.
- To learn Privacy, Security issues in Blockchain & various use cases.

B. Outline of the Course:

Sr No.	Title of the Unit	Minimum number of hours
1.	Introduction to Cryptography and Blockchain	07
2.	Cryptocurrencies	07
3.	Decentralized Applications	14
4.	Hyperledger Fabric	14
5.	Privacy, Security issues and Use Cases of Blockchain	03

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

E. Detailed Syllabus:

1.	**Introduction to cryptography and Blockchain** Public Key Cryptography, Hashing, Digital signature, History and Introduction to Blockchain, Types of Blockchain: Private and Public, Permissioned and Permission-less, Distributed Ledger	**07 hours**	**16 %**
2.	**Cryptocurrencies** Introduction to crypto primitives and various crypto-currencies, Bitcoin, Bitcoin consensus, Proof of Work, Proof of Stack, Bitcoin Script	**07 hours**	**16 %**
3.	**Decentralized Applications** Introduction to Ethereum, Smart Contracts, Mining, The consensus problem - Asynchronous Byzantine Models of fault tolerance, Decentralized Applications (Dapps) Platform & Ethereum Client - Geth, Solidity	**14 hours**	**31 %**
4.	**Hyperledger Fabric** Introduction to Permissioned Blockchain: Hyperledger Fabric, Microsoft Azure's Blockchain as a Service	**14 hours**	**31 %**
5.	**Privacy, Security issues and Use Cases of Blockchain** Privacy and Security issues in Blockchain like Zero-knowledge proof, double spending, selfish mining, 51% Attacks, potential disruptions with blockchain and other attacks. Use Cases of Blockchain: IOT, HealthCare Sector, Supply-Chain, Land Registry, and other use cases	**03 hours**	**07%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board etc.
- Attendance is compulsory in lectures and laboratory.

- Marks will be given based on continues evaluation, i.e. Unit Tests/Surprise tests/Quizzes/Seminar and Assignments based on course content will be given to the students at the end of each unit/topic.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. **Course Outcome (COs):**

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

CO1	To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
CO2	To learn basic concepts of Blockchain & various Cryptocurrencies.
CO3	To learn & implement Ethereum, Smart Contracts & Permissioned Blockchain, hyper ledger.
CO4	To learn Privacy, Security issues in Blockchain & various use cases

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	-	-	-	3	3
CO2	3	2	3	3	3	-	-	-	2	-	2	2	3	3
CO3	3	2	3	3	3	-	-	-	2	-	2	2	3	3
CO4	3	3	3	2	3	-	-	-	3	-	3	3	1	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ **Text Books:**

4. Imran Bashir, "Mastering Blockchain", Packt Second Edition, 2018
5. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain by Example", Packt

❖ **Reference Books:**

6. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" , Princeton University Press
7. William Mougayar, Vitalik Buterin, "The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology", Wiley
8. Pethuru Raj Ganesh Chandra Deka, "Blockchain Technology: Platforms, Tools and Use Cases", Elsevier Academic Press
9. Chris Dannen, "Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners", Apress
10. Ghassan Karame, Elli Androulaki, "Bitcoin and Blockchain Security", Artech
11. Sean Stein Smith, "Blockchain, Artificial Intelligence and Financial Services: Implications and Applications for Finance and Accounting Professionals", Springer
12. Rodrigo da Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, "Blockchain Technology for Industry 4.0: Secure, Decentralized, Distributed and Trusted Industry Environment", Springer

❖ **Reference Links/ e-content:**

1. https://www.coursera.org/learn/blockchain-basics
2. https://nptel.ac.in/courses/106/105/106105184/
3. https://nptel.ac.in/courses/106/104/106104220/
4. https://www.ibm.com/in-en/cloud/blockchain-platform
5. https://medium.com/blockchain
6. https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=blockchain
7. https://www.springer.com/gp/search?query=blockchain&submit=Submit

IT445: SOFTWARE GROUP PROJECT - IV

Credits and Hours:

Teaching Scheme	Theory	Project	Tutorial	Total	Credit
Hours/week	0	4	0	4	2
Marks	0	100	0	100	

A. Objective of the Course:

The main objectives for offering the course are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently.
- To provide exposure in the field of Software development.
- To provide a deep understanding of various domains of software projects.
- To provide an innovative ability to solve practical/utility problems.
- To provide a capacity to learn continually and interact with multidisciplinary groups.

B. Outline of the Course:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work weekly to respective internal guide.
- Project will be evaluated at least once per week in laboratory during the semester and final submission at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.
- Students have to submit project with following listed documents at the time of final submission.
    a. Project Synopsis
    b. Software Requirement Specification
    c. SPMP

d. Final Project Report/paper

e. Project Setup file with Source code [Uploaded on GitHub]

f. Project Presentation (PPT)

g. Video Recording (Per Project)A student has to produce some useful outcome by conducting experiments or project work.

- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 60

Total hours: 60

C. Instructional Method and Pedagogy:

13. Project Groups would be form of maximum two students.
14. Inter batch group formation is not permitted due to difficulties in progress tracking.
15. Students are advised to choose innovative and challenging definitions.
16. Batch wise project definitions must be unique.
17. Any management system would not be encouraged.
18. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
19. Student has to prepare report at end of semester as part of submission.
20. Report structure is finalized for semester end submission.
21. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
22. To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check before 15 days of external exam.
23. Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
24. Students have to bring internal review card hard copy on the day of internal review exam, after that they will bring filled review card on the day of external review.

D. Student Learning Outcome:

After the completion of the course students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.
CO5	Solve communication issues in large, complex software projects and Structure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Reference book:**

1. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
2. Sanjay Mohapatra, Software Project Management, Cengage Learning

3. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, “Engineering Design – A Project Based Introduction”, Wiley India Pvt. Ltd.
4. B. Hughes & M. Cotterell, “Software Project Management”, Tata Mcgraw Hills.

❖ **Web Materials:**

5. https://status.net/templates/project-report/
6. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
7. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
8. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
9. https://nptel.ac.in/courses/106/105/106105218/
10. https://www.youtube.com/watch?v=T3q6QcCQZQg
11. https://www.scribbr.com/category/research-paper/

IT446: SUMMER INTERNSHIP-II

Credit and Hours:

Teaching Scheme	Project	Total	Credit
Hours	90	90	3
Marks	150	150	

B. Objective of the Course:

Summer internships are required to be carried out in order to help students to find and know the applications of their theoretical knowledge enhance their company/industry/organization experience, get familiar with the company/industry/organization culture and work ethics.

The main objectives for offering the internship for the students are:

- To get perspective and experience of the field
- To make students company/industry/organization ready
- To get familiar with modern tools and technologies
- To enhance technical writing skills in reporting as per the company/industry/organization standards
- To get involved in design, development and testing practices followed in the company/industry/organization
- To enhance their soft-skills, presentation skills, interpersonal skills, documentation skills and office etiquettes required to sustain in company/industry/organization environment
- To participate in teamwork and preferably as part of a multi-disciplinary team
- To understand the professional and ethical responsibilities of an engineer
- To make them more productive, consistent and punctual.
- To make them aware about company/industry/organization best practices, processes and regulations.

B. Instructional Method and Pedagogy:

- Summer internship shall be at least 90 hours during the summer vacation only.
- Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
- The student must fill up and get approved a Summer Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline.
- Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed.
- During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and those of the University.
- Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later.
- The student shall submit two documents to the Coordinator for the evaluation of the summer internship:
    - Summer Internship Report
    - Summer Internship Assessment Form
- Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted through the presentation to the Coordinator by the first day of the new term.
- The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester.
- If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.

C. Format of Summer Internship Report:

The report shall comply with the summer internship program principles. Main headings are to be centered and written in capital boldface letters. Sub-titles shall be written in small letters and boldface. The typeface shall be Times New Roman font with 12pt. All the margins shall be 2.5cm. The report shall be submitted in printed form and filed. An electronic copy of the report shall be recorded in a CD and enclosed in the report. Each report shall be bound in a simple wire vinyl file and contain the following sections:

- Cover Page
- Page of Approval and Grading
- Abstract page: An abstract gives the essence of the report (usually less than one page). Abstract is written after the report is completed. It must contain the purpose and scope of internship, the actual work done in the plant, and conclusions arrived at.
- TABLE OF CONTENTS (with the corresponding page numbers)
- LIST OF FIGURES AND TABLES (with the corresponding page numbers)
- DESCRIPTION OF THE COMPANY/INDUSTRY/ORGANISATION: Summarize the work type, administrative structure, number of employees (how many engineers, under which division, etc.), etc. Provide information regarding
    - Location and spread of the company
    - Number of employees, engineers, technicians, administrators in the company
    - Divisions of the company
    - Your group and division
    - Administrative tree (if available)
    - Main functions of the company
    - Customer profile and market share
- INTRODUCTION: In this section, give the purpose of the summer internship, reasons for choosing the location and company, and general information regarding the nature of work you carried out.
- PROBLEM STATEMENT: What is the problem you are solving, and what are the reasons and causes of this problem.
- SOLUTION: In this section, describe what you did and what you observed during the summer internship. It is very important that majority of what you write should

be based on what you did and observed that truly belongs to the company/industry/organization.

- CONCLUSIONS: In the last section, summarize the summer internship activities. Present your observations, contributions and intellectual benefits. If this is your second summer internship, compare the first and second summer internships and your preferences.
- REFERENCES: List any source you have used in the document including books, articles and web sites in a consistent format.
- APPENDICES: If you have supplementary material (not appropriate for the main body of the report), you can place them here. These could be schematics, algorithms, drawings, etc. If the document is a datasheet and it can be easily accessed from the internet, then you can refer to it with the appropriate internet link and document number. In this manner you don't have to print it and waste tons of paper.

D. Learning outcomes:

After completion of the course students, will able:

- To apply knowledge and skills learned in company/industry/organization to real-world problems.
- To solve engineering problems.
- To function in a team work.
- To work with teammates from other disciplines.
- To use experience related to professional and ethical issues in the work environment.
- To explain the impact of engineering solutions developed in a project, in a global, economic, environmental, and societal context.
- To finds relevant sources (e.g., library, Internet, experts) and gather information.
- To demonstrate knowledge of contemporary issues related with engineering in general.
- To use new tools and technologies

E. Student Learning Outcome:

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

CO1	Demonstrate ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
CO2	Cultivate an understanding of their multidisciplinary interest, including the skills, responsibilities and career path of professionals through practice-oriented and 'hands-on' working experience.
CO3	An exhibit foresight, independent thinking, resourcefulness, and the ability to make decisions.
CO4	Develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in an industry.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3	-	-	-	-	-	-	-	-	3	2
CO2	1	2	3	2	-	-	-	-	-	-	-	-	1	1
CO3	1	1	2	-	-	-	-	2	2	3	-	-	2	1
CO4	-	-	-	-	-	-	-	-	-	-	-	-	1	3

B. Tech. (Information Technology) Programme

SYLLABI

(Semester –8)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT447: SOFTWARE PROJECT MAJOR

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	0	36	36	20
Marks	0	600(250+350)	600	

A. Objective of the Course:

Main objectives for offering the course are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently
- To provide exposure in the field of Software development
- To provide a deep understanding of various domains of software projects
- To provide an innovative ability to solve practical/utility problems
- To provide a capacity to learn continually and interact with multidisciplinary groups

B. Outline of the Course:

- Software Project includes course work on a specialized Subject or a Seminar.
- The course work shall be related to the area of his/her project research work.
- Students have to take 3 months training to the other software industry as the project work.
- The major project work provides students an opportunity to do something on their own and under the supervision of internal guide as well as guide from industry.
- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Project will be evaluated at least thrice during the semester by internal guide of the project and final submission at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as solution of particular problem by applying principles of Software Engineering.

- A student has to produce some useful outcome by conducting experiments or project work.
- Student can learn all aspects & functionality of specialized software from the industry.
- Students have to submit SRS, SPMP, Design documents, Code and Test Cases in form of Project report.

C. Instructional Method and Pedagogy:

Following are the General guidelines:

1) Semester 8th, teaching scheme is Practical 36 hours, with 20 credits worth of 600 marks (Out of 600 marks, 250 marks of internal and 350 marks of external evaluation)
   Note:
   a) Each defined project definition should be from Industry/Research organization/ Govt.organization/ technical issues/Real world problems.
   b) If industry defined project then maximum 2 or 3 students are allowed per project group. If in-house project then no group is allowed.
   c) The students are required to identify their problem and they are required to follow all the rules and instructions issued by department.

Final Year Project Policy:

1. Process for NOC:
Following is the process for 8th semester project for definition and company approval:

1. Select your domain
2. Select your company
3. Approve company from HoD Sir/TPR
4. Issue recommendation letter from TPR (write company address in to, fill the details of students and bring its printed copy and submit to concern TPR.)
5. Issue confirmation letter from company with brief definition, tools & technology (submit Xerox copy to concern TPR)
6. Approve definition form HoD Sir / Sr. faulty/TPR
7. The Process for Approval of the Project Definition:
8. The students must meet and discuss the definition of their final semester project with the HoD Sir/Faculty Member-Guide and get his approval by verifying to see that the following parameters:

7. The proposed project quality should be up to the status of a B.Tech final semester project quality.
8. The project should not be a conventional project.
9. The project should not be a purchased/3rd party developed project.
10. If the project is being carried forwarded from previous years then it must add substantial value to the previously done work on the project.
11. The project should be novel, original and having a possibility of good impact if the proposed solution get implemented.
12. Even if student claim it to be an Industry defined project, it should not be based on industry whose main objective is to make final semester project and give it to students.
13. Issue NOC from TPO (submit Xerox copy to Concern TPR)
14. In order to improve student's performance we are doing following exercise:
    1. Industrial visit
    2. Review and suggestions from internal guide
    3. Feedback from external guide

2. Process for Continuous Evaluation:
Following is the process for 8th semester project continuous evaluation:

15. Submit your project profile & synopsis to your internal Guide.
16. Report weekly to your internal guide with filled weekly report (At least 10 reporting is mandatory)
17. 2 internal presentations & 1 final presentation with project demonstration are required. Each internal presentation carries 50 Marks, 100 marks for report and 50 marks from internal guide & External presentation carries 350 marks.

a. Observation Canvas: Observation points from survey, Users, Stockholders, Activities
b. Ideation Canvas: People, Activities, Problem (that you are going to solve), Situation/Context/Location, Possible Solutions
c. Project Development Canvas: Purpose, People, Product Experience, Product Functions, Product Features, Components, Customer Revalidation
d. Business Model Canvas: Applications, Usage & Outcome

18. Submit hard binding report with CD.

3. Continuous evaluation Marks:

Project guide has to put the marks according to grade.

Range is given below:

A+ : 47-50

A : 44-46

A- : 41 - 43

B+ : 36-40

B : 31- 35

B- :26 - 30

C+ : 21-25

C : 16 - 20

C- : <=15

As per the performance of students, guide can give the marks.

For example: A+: One can give 47 - 50 as per performance.

D. Recommended Chapters/sections

1. Microscope Summery

2.Details of candidate and supervisor along with certificate of

- original work;
- Assistance, if any;
- Credits;

3. Aims and Objectives

4. Approaches to Project and Time Frame

5. Project Design Description with appendices to cover

Flow charts/Data Flow Diagram – Macro/Micro Level

Source code, If any

Hardware platform

Software Tools

Security Measures

Quality Assurance

Audit ability

1. Test Date and Result

A. Student Learning Outcome:

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

CO1	Explore the new ideas & the possible areas to work ahead.
CO2	Use the various methodologies useful for doing project work.
CO3	Investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
CO4	Apply the concepts and theories learnt in previous years of study and work placements

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	2	-	-	-	-	-	-	-	3	1
CO4	3	-	-	-	1	-	-	-	-	-	-	-	2	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

B. Recommended Study Material:

❖ Books

1. Reading Materials, web materials, Project reports with full citations
2. Books, magazines & Journals of related topics
3. Various software tools and programming languages compiler related to topic

❖ Web Link:

1. www.ieeexplore.ieee.org
2. www.sciencedirect.com
3. www.elsevier.com
4. http://spie.org/x576.xml