Index

17	Establish the correlation between the PEOs and Missions of the Department
18	Establish the correlation between the POs and the PEOs
19	Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences
20	Program Curriculum of B.Tech in ME
21	Syllabus with Course Outcomes
22	Code of Conducts of the Students

About the Institute

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) was established under the auspices of JIS Foundation under Section 2(f) of the UGC Act, 1956.

This Institute, which was founded in 2009, is now well-known for its innovative and rigorous curriculum, which has produced experts in a variety of businesses and sectors in India and beyond.

The Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex, which has been known for its research culture and excellence in imparting Engineering, Science, and Management education for the past 12 years and is located near the Dum Dum Metro Railway Station and International Airport, is known for its research culture and excellence in imparting Engineering, Science, and Management education.

The institute is a virtual paradise of pristine environment and beautiful beauty, nestled in a rural setting of lush green fields. The beautiful avenue of trees and flowers on campus, aptly titled "Green Field," attest to the importance of ecology and the environment. The atmosphere on campus is ideal for academic endeavours.

SurTech has taken a worldwide approach to research and teaching, focusing on foreign viewpoints and knowledge. The Institute is dedicated to greatness and strives for it constantly, accepting nothing less than the best. Its faculty, which includes intellectual giants from India and internationally, is the Institute's bedrock.

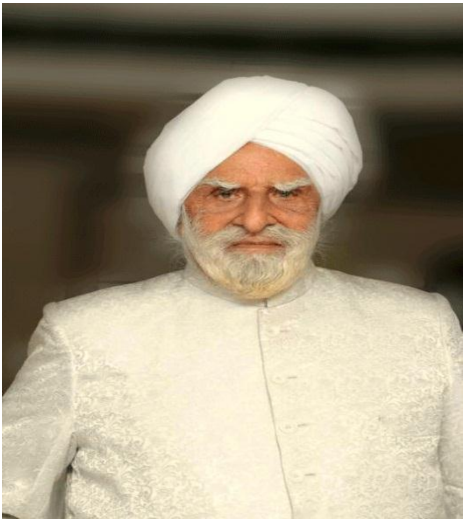
SurTech is in the forefront of using cutting-edge technology and preparing students for a globalised economy while also promoting holistic learning, unbiased knowledge, industry-focused skills, ethics, a cosmopolitan outlook, and accountability for actions.

SurTech is establishing a national and international footprint through partnerships with world-class universities, study abroad programmes, and overseas internships and research.

It provides a comprehensive curriculum across a wide range of engineering degree programmes. These programmes provide students with a variety of academic options.

The Institute provides great educational opportunities for youth from all over the world at a reasonable cost. Through its social responsibility efforts, the Institute also provides unwavering support for community services.

Message of the Founder Chairman Sir



"Vision looks inward and becomes duty. Vision looks outward and becomes aspiration. Vision looks upward and becomes faith."

---Late Sardar Jodh Singh

I always experienced a yearning to acknowledge my responsibilities and reciprocate by contributing to the growth and development of our society.

Years ago, when I visited my son's school, I perceived that the best way to advance society is by fostering education and it was at that moment that the dream and vision of JIS Group Educational Initiatives was conceived.

Now, when this vision of duty, aspiration and faith has become a reality, it is a proud moment for me and my team to see thousands of students pursuing higher education in JIS Group of Colleges and equipping themselves to become industry ready professionals for successful careers.

In this process the Group intends to unite all dimensions of Education from Undergraduate to Post

Graduate Programmes in Engineering and Technology, Computer Applications, Dental Science, Pharmacy, Hospitality, diverse streams of Management and so on under the same umbrella to optimize the reach of Educational Initiatives comprehensively and collectively in every stratum and corner of society towards a better future.

Our educational Initiatives believes that creating an academic foundation for social, cultural, scientific, economic, and technological development in our Nation can mature into Global Interface by giving way to education exchange in the international territory as well.

Therefore, our focus is to achieve unparalleled excellence that will bring development to our society and mankind by optimizing their potential, thereby establishing the observation of the renowned Journalist Sydney J. Harris on the role the purpose of education which is to "turn mirrors into windows".

---Late Sardar Jodh Singh
Founder Chairman, JIS Group

Message of the Managing Director Sir

In its broadest meaning, education is any act or experience that shapes a person's mind, character, or physical abilities.

Technically, education is the deliberate transmission of society's acquired knowledge, skills, and values from generation to generation. Thus, education is the basic fulcrum that drives societal growth.

The quality of education is clearly the priority in this era of globalization. Quality is not a single metric.

A good educational institution works to maintain and improve quality in all areas of operation.

I believe that a teacher may shape an educated and socially responsible human being by instilling two traits in students: curiosity and determination. Second, a teacher's noble life becomes a light for students when they establish strong values and put them into practice.

SurTech's objective to provide the best studying, teaching, and research possibilities for students and academics is to provide students with modern knowledge and strong values.

Our students find the thrill and rigor of new discoveries, and develop skills of investigation, evaluation, and communication that will serve them well in their jobs and lives.

Students' creativity, teamwork, and international competition thrive. SurTech is committed to academic independence and cultural diversity to attract students and teachers.

At Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech), we try to establish an environment that inspires personal and professional progress. Our efforts are focused on recognizing and understanding human talent and enthusiasm. SurTech is thus about "how we can best educate our students to confront the future's challenges".

With a 160-year tradition of academic achievement, scientific advancements, and high-tech innovation. I urge you to seize this fantastic chance and join us actively contributing to the globalization of our society.

With these remarks, I welcome everyone to SurTech and wish them every success on their new adventure with us.

---Sardar Taranjit Singh
MD, JIS Group

Message of the Principal Sir

I am honoured and greatly privileged to lead Dr. Sudhir Chandra sur Institute of Technology & Sports Complex (SurTech) and continue the ambitious strategy of addressing the challenges and opportunities of future to benefit our communities more widely.

On the global platform, India has the responsibility of transforming itself into a developed nation with a strong ethical system- this; however, is a great challenge, as this can only be achieved through the youth of today who have the power of ideas, ambition, ability and most importantly passion.

I believe passionately that we are all born with tremendous capabilities, but unfortunately, we lose these as time goes by and ironically this can be directly attributed to the current system of education which stifles the creative senses rather than enhancing it.

Stepping into the JIS Group of Institutions is stepping into a brighter world of education and a knowledge hub. It is worthwhile to take advantage of the opportunity to see the difference and enjoy the "joy of learning."
Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex (Formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) is one of India's top educational institutions, providing high-

quality education to students with the goal of becoming a world-class technical education and scientific research institution.

Since its inception in 2009, SurTech under the aegis of JIS Group has continued in subtle ways to pour fresh knowledge, human capital, and innovation into the engines of our society and nurturing a new generation of young professionals who are prepared to face the ever-changing social, economic, and technological landscape of our country to build a more inclusive and sustainable society on a national and international scale.
Over the last decade, the Institute has evolved into a strong blend of cutting-edge infrastructure and tightly connected human resources dedicated to providing professional education with a focus on creativity and innovation.

In a short span SurTech has become an ensemble of a multi-layered educational system which covers all aspects of diploma, under-graduate, and post-graduate education with smartly crafted and industry compliant course curricula using state-of-art infrastructure in a climate of possibility and transform lives and enhance communities.

The research activities of our faculty lead to an extraordinary enrichment of the experience of our students that is realized at both the graduate and undergraduate levels. The research training provided to our graduate students creates the next generation of scholars well-prepared to advance knowledge and transfer technology. The extension of research opportunities to an ever-increasing group of undergraduate students adds a dimension of experience to the undergraduate education that simply cannot be duplicated in the classroom.

SurTech heralds the latest and newest but never allows itself to be consumed by the intellectual fads of the day. Our graduates are smart, collaborative, and entrepreneurial. They use creative space of SurTech to actualize their potential. We are encouraging entrepreneurship and innovation on the campus.

We are facilitating campus recruitments and connecting our students to the world. The College strives for quality in training to instil a feeling of professional responsibility, social and cultural awareness, and to prepare students for leadership roles.

Campus life here emphasises the value of extracurricular activities in addition to academic learning, exposing students to a variety of fresh opportunities. All of this contributes to our student's development as a thoroughbred professional, well-suited to contribute to his chosen field while keeping an open mind to new ideas and concepts in industrial and technical breakthroughs through conducting Guest Lectures, Industrial Visits, Vocational Training (internships), student chapters of international professional groups, sponsored projects, and other means, students can meet with industry experts.

I can say with legitimate pride that the College has achieved far more than just the modest target set at the time of its inception by producing a trained human resource to serve the country in all walks of life and by contributing to the knowledge base.

I am glad to have this opportunity to serve as the Principal of this glorious institution. SurTech pledges to the state, the nation, and the world that our endeavours will benefit all citizens. I invite you to join and strengthen this venture.

---Prof. (Dr.) Saradindu Panda
PhD-Tech (NIT, DGP), M. Tech (VLSI, J.U), BE (UIT, BU)
Chair, IEEE CASS Kolkata Section
IQAC Member of Swami Vivekananda College, RKM, Rahara
MIEEE, MIASSE, MIEI, MIETE, MIAENG, MCSTA, MIRED, MIAE, MITEEA

Institutional Vision

To be a top global technology institute that creates leaders & innovators and generates new knowledge for society & industry via transformative education.

Institutional Mission

Excellence in Education: *Education of world-class quality, based on ethics and critical thinking, for the betterment of life.*

Innovative Research: *An innovation ecosystem to advance knowledge and tackle pressing issues.*

Impactful People: *Happy, accountable, compassionate, and effective employees and pupils.*

Productivity Enhancement: *Active engagement with national and international companies, as well as institutions, to increase productivity and economic development.*

Service to Society: *Providing knowledge and compassion to the region and the planet.*

Core Values

Integrity, Excellence, Accountability, Transparency, and Empathy are the abiding ideals established by the Institute.

Integrity & Honesty:

Research and teaching must take place in an atmosphere of academic freedom and honesty. In all its efforts, the Institute shall uphold the highest ethical standards.

Equality:

We are dedicated to establishing an institution and a community in which everyone is valued and judged based on their contributions and accomplishments rather than their gender, race, religion, physical abilities, sexual identity, or socioeconomic status. We shall raise awareness of individual and institutional racism, as well as fight to abolish it, through the activities of this institution.

Pursuit of Excellence:

The Institute is dedicated to excellence in all aspects of its operations and will strive for continuous improvement through internal and external reviews. Awards and honours will be given out by the Institute to recognize remarkable contributions.

Synergy through Teamwork:

To become synergistic and succeed, the institute concentrated on four key characteristics: a clear team purpose, effective communication, empowerment so that the team can lead itself, and ensuring that everyone is committed to the goal.

Accountability:

The Institute is dedicated to creating an atmosphere in which each member of the community recognizes and accepts responsibility for upholding and strengthening our principles.

Empathy:

The Institute's research and education programs will include an awareness of the conditions of our society's poorer members, as well as contributions to solving their problems.

Transparency:

The Institute will follow established procedures and rules, which will be communicated to all stakeholders. All valuable information about the Institute's operations will be made available.

Quality Policy

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech) is dedicated to academic excellence, providing high-quality technical education, training, and expertise in a variety of industries, and engineering programmes, enhancing students' inherent abilities, capabilities, and thought processes while also promoting their engineering and technological skills. We are committed to meeting the criteria and improving the efficacy of our quality management system on a continuous basis.

Quality Objectives

- To focus on the students' total development by increasing their technological and managerial skills, as well as their leadership talents, and to guarantee that they are well-rounded.
- To foster an environment that promotes effective teaching, active learning, and purposeful research for economic progress.
- Incorporating value-added programmes into the curriculum and increasing students' job chances.
- To review the effectiveness of the institute's programmes on a regular basis, considering the demands of the industry and other areas of employment, and responding positively to those needs.
- To expose students to the difficulties of the twenty-first century while also giving opportunities for them to think creatively and display entrepreneurship abilities to contribute effectively to the nation's growth.
- To provide research creation, consulting, testing, and customised training to satisfy the industry's specific demands, thereby encouraging students to pursue self-employment and entrepreneurship.
- To provide cutting-edge technological infrastructure and to inspire students to reach their full potential.
- To foster mutually beneficial collaboration with industry, other institutions, and organisations.
- To ensure that the Quality Management System is continually improved.
- Benchmarking the institution against top institutions on a regular basis to adopt best practises for quality improvement.

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

BOG Members

1	Prof. (Dr.) G.L. Datta (Educationist)	Chairman
2	The Regional Director, AICTE, Eastern Regional Office	Member
3	Mr. Partha Ghosh, State Govt. Nominee	Member
4	Prof. Narayan Banerjee, MAKAUT Nominee	Member
5	Mr. Taranjit Singh, Managing Trustee, JIS Foundation	Member
6	Mr. Haranjit Singh, Trustee Member, JIS Foundation	Member
7	Mr. Amrik Singh, Trustee Member, JIS Foundation	Member
8	Mr. Simarpreet Singh, Trustee Member, JIS Foundation	Member
9	Mr. Harjot Singh, Trustee Member, JIS Foundation	Member
10	Mr. Amanjot Singh, Trustee Member, JIS Foundation	Member
11	Mr. U. S. Mukherjee, Deputy Director, JIS Group	Member
12	Mr. Amit Srivastava, Managing Director, Hash Technology	Member
13	Dr. Asit Guha, Advisor , JIS Group (Educationist)	Member
14	Dr. Shefalika Ghosh Samaddar, Professor, Dept. of CSE, DSCSITSC	Member
15	Mr. Vivek Shaw, Asst. Prof of BSHU & In-charge, Exam Cell	Member
16	Dr. Saradindu Panda, Principal, DSCSITSC	Member Secretary

Academic Council

1	Dr. Saradindu Panda,	Chairman
Three Nominees of MAKAUT, WB		
2	Prof. (Dr.) Manojit Mitra,	University Nominee
3	Prof.(Dr.) Subhasish	University Nominee
4	Prof.(Dr.) Amitava Chatterjee,	University Nominee
Experts / Academicians from Outside the College		
5	Prof.(Dr.) Goutam Sutradhar,	External Academic
6	Prof. (Dr.) Debashis De,	External Academic
7	Prof. (Dr.) Sibapriya	External Academic
8	Mr. Atanu Chowdhury, Deputy General Manager- HR & IR, Electrosteel Castings LTD	Industry Expert
9	Mr. Turjasu Pyne, Senior	Industry Expert
Dean (Academics), IQAC Coordinator & Controller of Exam		
10	Mr. Vivek Shaw, Asst. Prof.,	Member Secretary
11	Ms. Amrita Chadha, PA to	Member
All the Heads of Department		
12	Mr. Baibaswata Das, Asst.	Member
13	Ms. Rinku Supakar, Asst.	Member
14	Mr. Anirbit Sengupta, Asst.	Member
15	Mr. Arindam Mukherjee,	Member
16	Mr. Anirban Chowdhury,	Member
17	Dr. Ruma Sen, Asst. Prof.	Member
Four Teachers representing different categories		
18	Dr. Shefalika Ghosh	Member
19	Dr. Supriyo Srimani, Asst.	Member
20	Dr. Abhijit Kundu, Asst. Prof,	Member
21	Dr. Biswajit Gayen, Asst.	Member

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

Internal Quality Assurance Cell (IQAC)

Sl.N	Name	Designation
1	Prof. (Dr.) Saradindu Panda, Principal	Chairman
2	Mr. Vivek Shaw, Asst. Prof., Dept. of BSH	Coordinator
3	Mr. Simarpreet Singh, Director, JIS Group	Management Representative
4	Prof. (Dr).Asish K Mukhopadhyay , "Margadarshak-AICTE", Professor (Emeritus), IET, Bundelkhand University, Jhansi, U.P	Academic Expert
5	Dr. Supriyo Srimani, Asst. Prof. Dept. of ECE	Faculty
6	Dr. Shefalika Ghosh Samaddar, Prof. Dept. of	Faculty
7.	Mr. Arindam Mukherjee, Asst. Prof.(TIC) Dept.	Faculty
8.	Mr. Anirban Chowdhury, Asst.Prof.(TIC),	Faculty
7.	Mr. Anirbit Sengupta, Asst. Prof., (TIC) Cum Admission Coordinator, Dept. of ECE	Faculty Representative
8.	Mr. Subhasish Halder, Asst. Prof., Dept. of ME	Faculty
9.	Ms. Debina Dey, Manager, Industry Alliance,	Dept. of T&P
10.	Ms. Amrita Chadha, PA to Principal	Admin
11	Ms. Dazy Rani, Asst. Registrar, Dept. of Admin	Admin
12.	Mr. Arunava Kundu, Asst. Treasurer, Surermath Association DumDum	Nominee from local society
13.	Mr. Rivu Ghosh, System on Chief Design	Nominee from
14.	Mr. Debasish Mazumdar, Associate Director, CDAC, Kolkata	Industry Representative
15.	Dr. Dipra Bhattacharya	Parents
16.	Mr. Dipi Ranjan Rauth, 3rd Year, Dept. of CSE	Student
17.	Ms. Debosmita Ganguli, Dept. of ECE	Alumni

Administrative Offices

Details	Name of the Contact Person	Contact Number
Academics-Contact Person Details	Principal	9051978666
Admission-Contact Person Details	Aviroop Dewan	6291977707
Centre For Technical Support-Contact Person Details (System Admin)	Abhishek Bysack	7003763638
Estate Office -Contact Person Details (Site Supervision)	Suman Mukherjee	7003831004
Human Resource-Contact Person Details	Amrita Chadha	7829522758
Institutional Information Service (IIS)-Contact Person Details	Nirupam Sarkar	8902496652
TNP & International and Public Relations-Contact Person Details	Debina Dey	9836158442
Office of Student's Welfare-Contact Person Details	Nirupam Sarkar	8902496652
Purchase Office & Store – Contact Person Details	Rahul Chowdhury	8820426030
Registrar Office-Contact Person Details	Amrita Chadha	7829522758
Examination Cell and Student Record Section-Contact Person Details	Vivek Shaw	8296921062
Student Outreach Department-Contact Person	Nirupam Sarkar	8902496652

About the Department

Department of Computer Science and Engineering has been successfully functioning since 2009. It offers B.Tech (Computer Science and Engineering). Global excellence and local relevance in teaching, research, and technology development is the main objective of the department.

Every year close to 180 students in B.Tech get admitted in the department. The college attracts very bright students because of the department reputation as well as the excellent placement records. Beyond their excellence in academics, the students show their talents in quizzes, debates, games and many other activities. The students are placed in top companies, top universities across the globe.

The Department of CSE takes care of Software & Hardware requirements of the entire Institute. The strength of the CSE Department is its Alumni, which adds a good amount of perception rating to the department by being most illustrious.

Department is committed to encourage students/researchers to carry out innovative research in the field of Computer Science & Engineering, keeping excellence in focus and deliver quality services to match the needs of the technical education system, industry and society.

Students of CSE department are motivated to be innovative in their thinking while being strong in the Computer Science Core Knowledge.

Faculty of CSE are always dedicated and devoted towards the comprehensive development of their students by training them physically through enough sports & games; psychologically through technical competitions globally.

The department of CSE as a whole aims at the development of Ace Computer Science Professionals with ethical values & societal concern.

Departmental Vision

To be a Department of high repute focused on quality education and innovative research in Computer Science & engineering that prepares professionals and entrepreneurs to lead technical, economic and social development of the society.

Departmental Mission

M1: To provide academic environment for the development of skilled professionals empowered with knowledge, skills, values, and confidence to take a leadership role in the field of Computer Sc. & Engineering.

M2: To cultivate research culture resulting in knowledge and innovative technologies that contributes to sustainable development of the society.

M3: To inculcate work ethics and commitment in students for their future endeavour's to serve socio-economic needs.

M4: To produce graduates with personal and professional responsibilities with dedication to lifelong learning.

Program Educational Objectives

PEO1: Graduates will work efficiently as computer science engineers revealing ethical knowledge and leadership qualities in multi-disciplinary areas.

PEO2: Graduates will accustom with varying technologies, tools and societal requirements.

PEO3: Graduates will design and develop solutions that meet individual and industry needs.

PEO4: Graduates will be motivated for life-long learning to adapt the innovation and changes through research and development.

Program Outcome (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Program Outcome (PO)

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome

PSO 1: Professional Skills

The ability to understand, analyzes, design, implement and conduct research in the domain of Computer Science & Engineering.

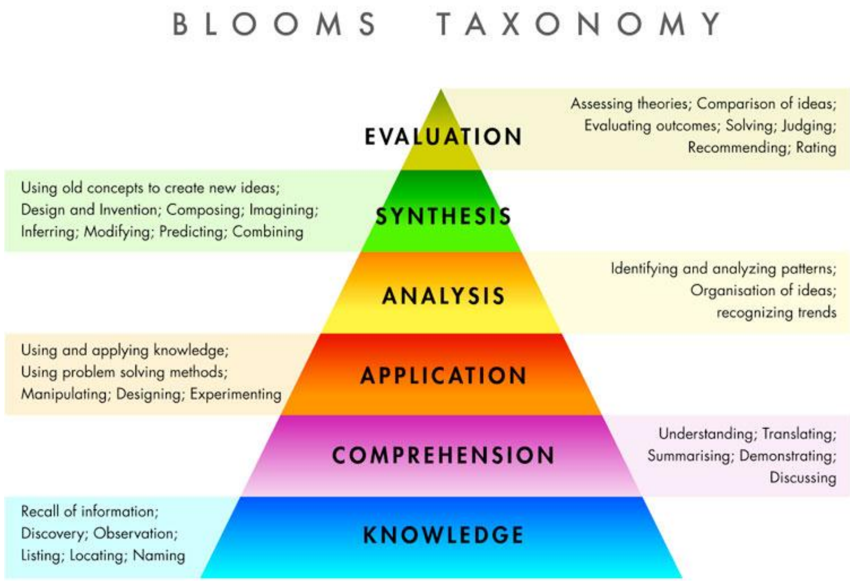
PSO 2: Problem Solving Skills

Ability to apply computational technique and methodologies to solve problems using suitable mathematical analysis, data structure and suitable algorithm.

PSO 3: Ethics and Career Development

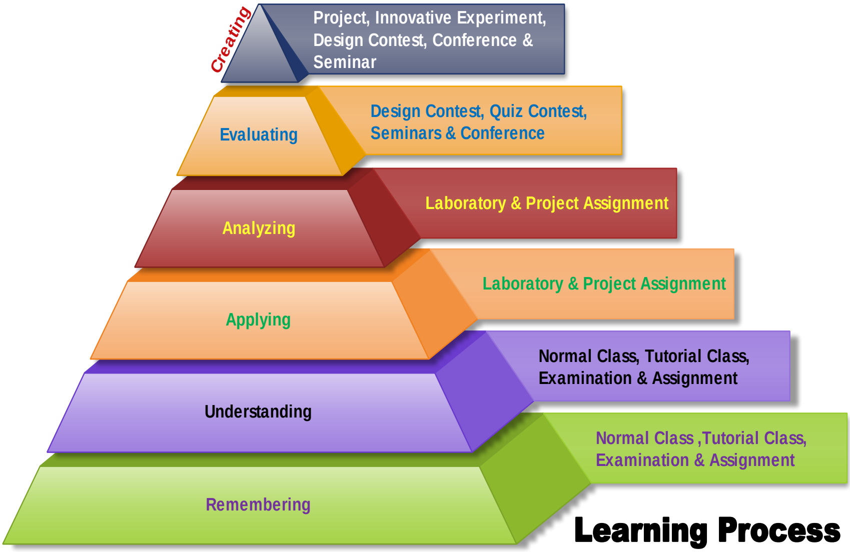
Inculcate skills required for a successful career in the industry, academic as well as research and development based on principles of software project management, teamwork and ethical practices and also nurture the quest for higher levels of knowledge.

Bloom's Taxonomy of Learning Domains



Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr Benjamin Bloom to promote higher forms of thinking in education, such as analysing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts (rote learning). It is most often used when designing educational, training, and learning processes.

Bloom's Revised Taxonomy



Lorin Anderson, a former student of Bloom, and David Krathwohl revisited the cognitive domain in the mid-nineties and made some changes, with perhaps the three most prominent ones being (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, Wittrock, 2000):

changing the names in the six categories from noun to verb forms

rearranging them as shown in the chart below

creating a processes and levels of knowledge matrix

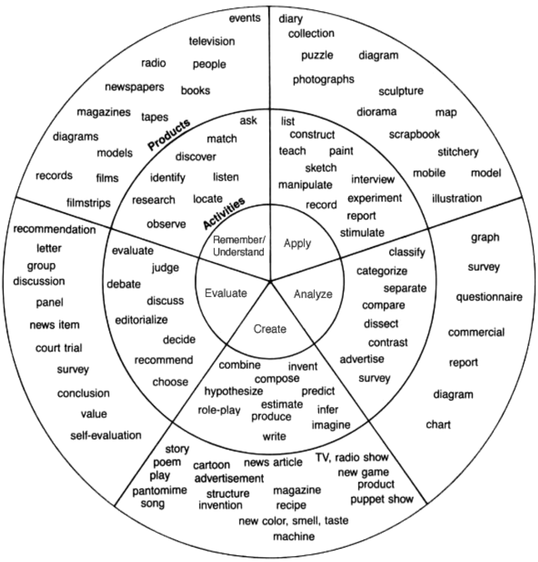
This new taxonomy reflects a more active form of thinking and is perhaps more accurate. The new version of Bloom's Taxonomy, with examples and keywords is shown below, while the old version may be found here.

Mapping Out Learning Outcomes and Assessment Levels with Revised Bloom's Taxonomy

This document focuses on cognitive domains and the dimensions of knowledge. Detailed explanations for each domain and the use of this table follow below.

(different levels of thinking)

	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Knowledge Dimension	• Recognizing • Listing • Describing • Identifying • Retrieving • Naming • Locating • Finding • Recalling	• Interpreting • Exemplifying • Summarizing • Inferring, • Paraphrasing • Classifying • Explaining	• Implementing • Carrying out • Using • Executing	• Comparing • Organizing • Deconstructing • Attributing • Outlining • Structuring • Integrating	• Checking • Hypothesizing • Critiquing • Experimenting • Judging, Testing • Detecting • Monitoring	• Designing • Constructing • Planning • Producing • Inventing • Devising • Making • Generating



Mapping of PEOs with Mission of the Department

PEO Statements	M1	M2	M3	M4
PEO1: 1. Graduates will work efficiently as computer science engineers revealing ethical knowledge and leadership qualities in multi-disciplinary areas.	3	2	2	1
PEO2: 2. Graduates will accustom with varying technologies, tools and societal requirements.	3	2	2	1
PEO3: Graduates will design and develop solutions that meet individual and industry needs	3	2	1	2
PEO4: Graduates will be motivated for life-long learning to adapt the innovation and changes through research and development	1	3	1	3

Note: M1, M2, M3, M4, M5 are distinct elements of Mission statement. Enter correlation levels 1, 2 or 3 as defined below:

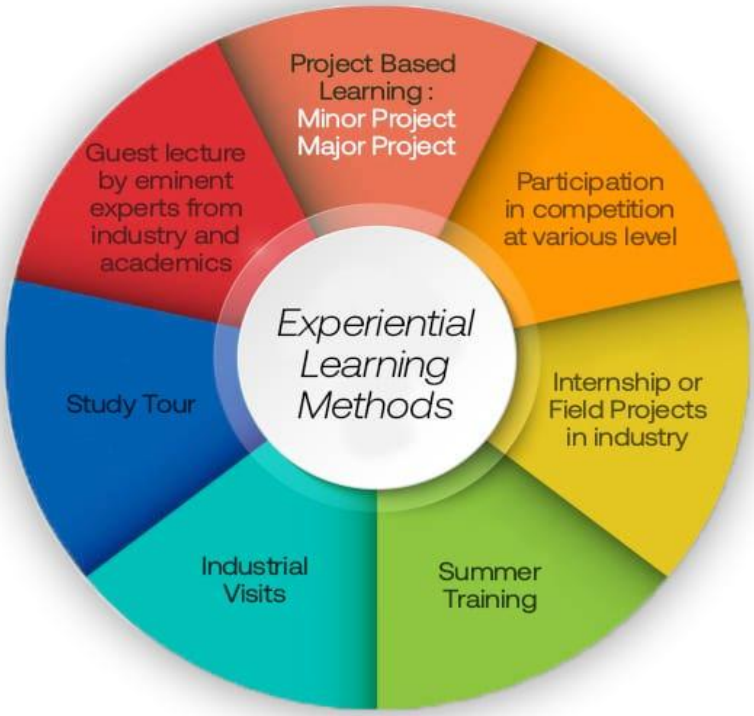
‘1’: Slight(Low)
‘2’: Moderate (Medium)
‘3’: Substantial (High)
‘--‘: *If there is no correlation.*

Mapping of PEOs with POs

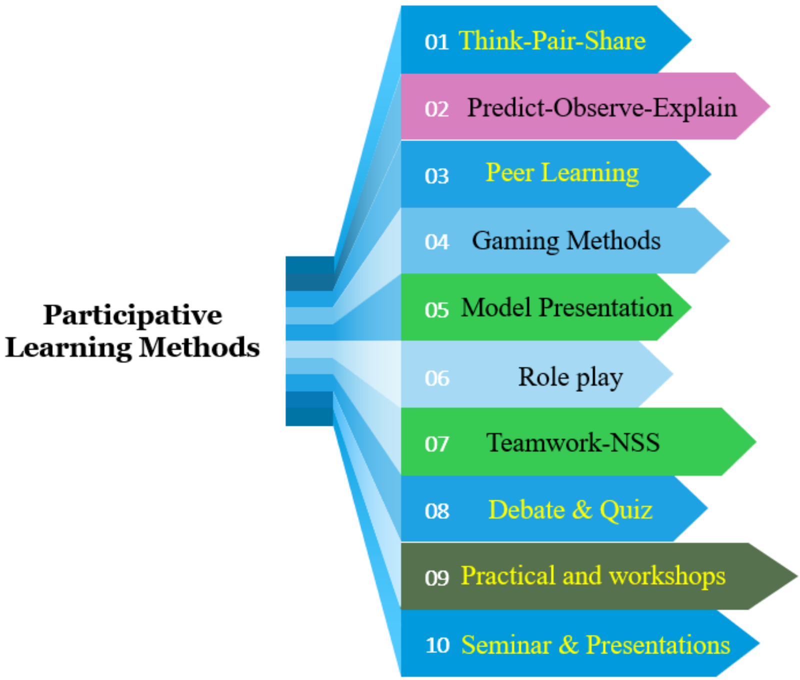
Program Educational Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	1	1	2	3	2	1	2	1	1	2
PEO2	3	3	3	1	3	3	2	1	2	3	1	1
PEO3	2	3	2	3	3	2	3	1	2	3	2	2
PEO4	1	2	3	3	2	2	2	3	3	3	3	3

3-Strongly Mapped, 2-Moderately Mapped, 1-Weakly Mapped,0-NA

Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences

Departmental Curriculum Structure

First Year First Semester							
Mandatory Induction Program- 3 weeks duration							
Sl No.	**Category**	**Subject Code**	**Subject Name**	**Total Number of contact hours**			**Credits**
				L	**T**	**P**	
Theory							
1	Basic Science course	BS-PH101/ BS-CH101	Physics-I (Gr-A)/ Chemistry-I(Gr-B)	3	1	0	4
2	Basic Science course	BS-M101/ BS-M102	Mathematics –IA*/ Mathematics –IB *	3	1	0	4
3	Engineering Science Courses	ES-EE101	Basic Electrical Engineering	3	1	0	4
	Total Theory			**9**	**3**	**0**	**12**
Practical							
1	Basic Science course	BS-PH191/ BS-CH191	Physics-I Laboratory (Gr-A)/ Chemistry-I Laboratory (Gr-B)	0	0	3	1.5
2	Engineering Science Courses	ES-EE191	Basic Electrical Engineering Laboratory	0	0	2	1
3	Engineering Science Courses	ES-ME191/ ES-ME192	Engineering Graphics & Design(Gr-B)/ Workshop/Manufacturing Practices(Gr-A)	1	0	4	3
	Total Practical			**1**		**9**	**5.5**
	Total of First Semester			**10**	**3**	**9**	**17.5**

* Mathematics –IA (BS-M101) - CSE & IT
Mathematics –IB (BS-M102) - All stream except CSE & IT

First Year Second Semester

Sl No.	Category	Subject Code	Subject Name	Total Number of contact hours			Credits
				L	T	P	
Theory							
1	Basic Science courses	BS-PH201/ BS-CH201	Physics-I (Gr-B)/ Chemistry-I (Gr-A)	3	1	0	4
2	Basic Science courses	BS-M201/ BS-M202	Mathematics –IIA#/ Mathematics –IIB #	3	1	0	4
3	Engineering Science Courses	ES-CS201	Programming for Problem Solving	3	0	0	3
4	Humanities and Social Sciences including Management	HM-HU201	English	2	0	0	2
	Total Theory			**11**	**2**	**0**	**13**
Practical							
1	Basic Science courses	BS-PH291/ BS-CH291	Physics-I Laboratory (Gr-B)/ Chemistry-I	0	0	3	1.5
2	Engineering Science Courses	ES-CS291	Programming for Problem Solving	0	0	4	2
3	Engineering Science Courses	ES-ME291/ ES-ME292	Engineering Graphics & Design(Gr-A)/ Workshop/Manufacturing Practices(Gr-B)	1	0	4	3
4	Humanities and Social Sciences including Management courses	HM-HU291	Language Laboratory	0	0	2	1
	Total Practical			**1**	**0**	**13**	**7.5**
	Total of Second Semester			**12**	**2**	**13**	**20.5**

Mathematics –II (BS-M201) - CSE & IT
Mathematics –II (BS-M202) - All stream except CSE & IT

	Group-A	**Group-B**
1st Year 1st Semester	Physics-I (BS-PH101); Workshop/Manufacturing Practices (ES-ME192)	Chemistry-I (BS-CH101); Engineering Graphics & Design (ES-ME191)
1stYear 2nd Semester	Chemistry-I (BS-CH201); Engineering Graphics & Design (ES-ME291)	Physics-I (BS-PH201); Workshop/Manufacturing Practices (ES-ME292)

Semester III (Second year)							
Sl. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	***T***	***P***	
Theory							
1	Engineering ScienceCourse	ESC 301	Analog and Digital Electronics	3	0	0	3
2	Professional Core Courses	PCC-CS301	Data Structure & Algorithms	3	0	0	3
3	Professional Core Courses	PCC-CS302	Computer Organization	3	0	0	3
4	Basic Science course	BSC 301	Mathematics-III (Differential Calculus)	2	0	0	2
5	Humanities & SocialSciences including Management courses	HSMC 301	Economics for Engineers (Humanities-II)	3	0	0	3
Practical							
6	Professional Core Courses	PCC-CS393	IT Workshop (Sci Lab/MATLAB/Python/R)	0	0	4	2

7	Engineering ScienceCourse	ESC 391	Analog and Digital Electronics	0	0	4	2
8	Professional Core Courses	PCC-CS391	Data Structure & Algorithms	0	0	4	2
9	Professional Core Courses	PCC-CS392	Computer Organisation	0	0	4	2
Total Credit							***22***

Semester IV (Second year)							
Sl. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	***T***	***P***	
Theory							
1	Professional Core Courses	PCC- CS401	Discrete Mathematics	3	1	0	4
2	Professional Core Courses	PCC-CS402	Computer Architecture	3	0	0	3
3	Professional Core Courses	PCC- CS403	Formal Language &Automata Theory	3	0	0	3
4	Professional Core Courses	PCC- CS404	Design & Analysis of Algorithms	3	0	0	3
5	Basic Science courses	BSC 401	Biology	2	1	0	3
6	Mandatory Courses	MC401	Environmental Sciences	1	-	-	1
Practical							

7	Engineering Science Course	PCC-CS 492	Computer Architecture	0	0	4	2
8	Professional Core Courses	PCC- CS494	Design & Analysis of Algorithms	0	0	4	2
						Total credits	**20**

Semester V (Third year)							
Sl. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	***T***	***P***	
Theory							
1	Engineering Science Course	ESC501	Software Engineering	3	0	0	3
2	Professional Core Courses	PCC-CS501	Compiler Design	3	0	0	3
3	Professional Core Courses	PCC-CS502	Operating Systems	3	0	0	3
4	Professional Core Courses	PCC-CS503	Object Oriented Programming	3	0	0	3
5	Humanities Social Sciences including	HSMC-501	Introduction to Industrial Management (Humanities III)	3	0	0	3

	Management courses						
6	Professional Elective courses	PEC-IT 501A/B/C/D	(Elective-I) Theory of Computation/Artificial Intelligence/ Advanced Computer Architecture/ Computer Graphics	3	0	0	3
7	Mandatory Courses	MC- CS501	Constitution of India/ Essence of Indian Knowledge Tradition	-	-	-	0
Practical							
8	Professional Core Courses	ESC- 591	Software Engineering		0	4	2
9	Professional Core Courses	PCC-CS592	Operating Systems		0	4	2
10	Professional Core Courses	PCC-CS593	Object Oriented Programming		0	4	2
				Total credits			**24**

Semester VI (Third year)							
SL. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	***T***	***P***	
Theory							
1	Professional Core Courses	PCC-CS601	Database Management	3	0	0	3
2	Professional Core Courses	PCC-CS602	Computer Networks	3	0	0	3
3	Professional Core Courses	PEC-IT601A/B/	(Elective-II) Advanced Algorithms/ Distributed Systems/ Signals & Systems / Image Processing	3	0	0	3
4	Professional Core Courses	PEC- IT602A/B/	(Elective-III) Parallel and Distributed Algorithms/ Data Warehousing & Data Mining/Human Computer Interaction/Pattern Recognition	3	0	0	3
5	Open Elective courses	OEC- IT601A/B	(Open Elective-) Numerical Methods/ Human Resource Development and Organizational	3	0	0	3

			Behavior				
6	Project	PROJ- CS601	Research Methodology	3	0	0	3
Practical							
7	Professional Core Courses	PCC- CS691	Database Management	0	0	4	2
8	Professional Core Courses	PCC-CS692	Computer Networks	0	0	4	2
				Total credits			**22**

Semester VII (Fourth year)							
Sl. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	***T***	***P***	
Theory							
1	Professional Elective courses	PEC-CS701A/B/C/D/E	(Elective-IV) Quantum Computing/ Cloud Computing/ Digital Signal Processing/Multi-agent Intelligent Systems/Machine learning	3	0	0	3
2	Professional Elective courses	PEC-CS702A/B/C/D/E	(Elective-V) Neural Networks and Deep Learning/ Soft Computing/ Ad-Hoc and Sensor Networks/Informati	3	0	0	3

			on Theory and Coding/Cyber Security				
3	Open Elective courses	OEC-CS701A/B / C	(Open Elective-II) Operations Research/Multimedia Systems/Introduction to Philosophical Thoughts	3	0	0	3
4	Humanities &Social Sciences including Management courses	HSM C 701	Project Management and Entrepreneurship	2	1	0	3
5	Project	PROJ-CS781	Project-II	0	0	12	6
Total credits							**18**

Semester VIII (Fourth year)

Sl. No.	***Type of course***	***Code***	***Course Title***	***Hours per week***			***Credits***
				L	T	P	
1	Professional Elective courses	PEC-CS801A/ B/C/D/E	(Elective-VI) Signals and Networks/Cryptography & Network Security/ Speech and Natural Language Processing/ Web and Internet Technology/Internet of Things	3	0	0	3

2	Open Elective courses	OEC-CS801A/B / C/D/E	Open Elective-III Big Data Analysis/Cyber Law and Ethics/ Mobile Computing/Robotics /S oft Skill & Interpersonal Communication	3	0	0	3
3	Open Elective courses	OEC-CS802A/B / C	(Open Elective-IV) E-Commerce and ERP/Micro-electronics and VLSI Design/Economic Policies in India	3	0	0	3
4	Project	PROJ-CS881	Project-III	0	0	12	6
Total Credit							15

Syllabus & Course Outcomes

1st Semester/1st Yr

BS-CH101: Chemistry-I

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of molecules
CO2	Rationalise bulk properties and processes using thermodynamic considerations
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

CO4	Rationalise periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.

CO-PO Mapping

Co & PO Mapping BS-CH101 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3	2	2	-	2	-	-	-
CO2	3	3	3	3	3	3	3	-	2	-	-	2
CO3	2	3	3	3	3	3	2	-	3	3	-	-
CO4	3	3	3	3	3	2	-	-	-	2	-	2
Average	**2.75**	**3**	**2.75**	**3**	**3**	**2.5**	**2.33**	**-**	**2.33**	**2.5**	**-**	**2**

Syllabus (BS-CH101)

Unit I: Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Unit II: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications inmedicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magneticresonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Unit V: Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Unit VI: Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Unit VII: Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Books

Learning Resources:

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Physical Chemistry, by P. W. Atkins
4. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
5. Physical Chemistry, P. C. Rakshit, Sarat Book House
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH101: Physics

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.
CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
CO3	Apply the wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser to solve real life problem
CO4	Understand Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO–PO Mapping BS-PH101 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	-	2	-	-	2	-	2	-	-	3

CO2	3	3	-	2	-	-	2	-	2	-	-	3
CO3	3	3	-	3	-	-	-	-	2	-	-	3
CO4	3	3	-	3	-	-	-	-	2	-	-	3
avg	**3**	**3**	**-**	**2.5**	**-**	**-**	**2**	**-**	**2**	**-**	**-**	**3**

Syllabus

UNIT 1.

Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function F = -grad V, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.

UNIT 2.

Optics

Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max; min, & intensity and qualitative discussion of fringes); diffraction grating (resolution formulae only), characteristics of diffraction grating and its applications.

Polarization:

Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.

Lasers:

Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3.

Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar.
Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.
Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 4.

Quantum Mechanics

Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

UNIT 5.

Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Books

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley

3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M101: Mathematics - IA

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Apply the concept and techniques to differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
CO2	Explain the domain of applications of mean value theorems to engineering problems.
CO3	Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
CO4	Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
CO5	Develop the concept of Eigen values, Eigen vectors, Diagonalization of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.

CO-PO Mapping

CO & PO Mapping BS-M101 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	-	2	-	2	-	2	2
CO2	3	3	2	-	2	2	2	-	2	-	-	-
CO3	3	3	2	2	2	2	2	-	2	-	3	2
CO4	3	3	2	2	3	2	2	-	-	-	2	3
CO5	3	3	3	2	2	-	-	-	-	-	2	1
Avg	**3**	**3**	**2.4**	**2**	**2.2**	**2**	**2**	**-**	**2**	-	**2.25**	**2**

Syllabus (BS-M101)

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin’s theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Matrices [7L]

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4: Vector Spaces [9L]

Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 5: Vector Spaces (Continued) [10L]

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Books

Learning Resources:

1. Reena Garg, Engineering Mathematics-I, Khanna Publishers.

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.

6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.

7. S.K. Mapa, Higher Algebra: Abstract and Linear, Sarat Book House Pvt.Ltd.

8. Hoffman and Kunze: Linear algebra, PHI.

BS-M102: Mathematics - IB

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
CO2	Understand the domain of applications of mean value theorems to engineering problems.
CO3	Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
CO4	Apply the knowledge for addressing the real life problems which comprise of several variables or attributes and identify extremum points of different surfaces of higher dimensions.
CO5	Learn and apply the concept of rank-nullity, eigen values, eigen vectors, diagonalization and orthogonalization of matrices for understanding physical and engineering problems.

CO-PO Mapping

CO & PO Mapping BS-M102 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	2	2	2	-	-	1	2	2
CO2	3	3	2	2	2	2	-	-	2	-	1	2
CO3	3	3	3	2	2	-	2	-	2	1	-	1
CO4	3	3	2	2	3	2	-	-	-	-	2	2
CO5	3	3	2	2	2	2	1	-	1	1	2	1
Avg	3	3	2.4	2	2.2	2	1.67	-	1.67	1	1.75	1.6

Syllabus (BS-M102)

Module 1: Calculus (Integration) [8L]

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus (Differentiation) [6L]

Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin’s theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Sequence and Series [11L]

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval’s theorem.

Module 4: Multivariate Calculus [9L]

Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.

Module 5: Matrices [8L]

Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Books

Learning Resources:

1. Reena Garg, Engineering Mathematics-I, Khanna Publishers.

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.

6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.

ES-EE101: Basic Electrical Engineering

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO'S	Statement
CO1	To describe fundamentals of DC and AC circuits
CO2	To explain the operating principle of transformer
CO3	To illustrate construction, working of Electrical Machines
CO4	To classify different power converters and installation process

CO-PO Mapping

CO & PO Mapping ES-EE101 to PO attainment

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	2	2	2	3	-	2	-	-	3
CO 2	3	3	3	2	2	2	3	-	2	-	-	3
CO 3	3	2	3	2	2	2	3	-	2	-	-	3
CO 4	3	2	2	2	2	2	3	-	2	-	-	3
Avg	**3.00**	**2.50**	**2.50**	**3.00**	**2.00**	**2.00**	**3.00**	**-**	**2.00**	**-**	**-**	**3.00**

Syllabus (ES-EE101)

Module 1: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Power Converters

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Books

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Book Publishing Co. (P) Ltd., Delhi.
2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
6. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

BS-CH191: Chemistry-I Lab

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	DESCRIPTION
CO1	Analyse sample by apply instruments like viscometer, pH-meter, Conductometer, Potentiometer etc to achieve high accuracy.
CO2	Analyse inorganic salts by semi-micro techniques
CO3	Analyse quantitative chemicals present in different samples

CO-PO Mapping

Co & PO Mapping BS-CH191 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	3	2	2	-	3	2	1	1
CO2	1	3	3	3	-	1	2	-	3	2	2	2
CO3	3	3	3	3	3	2	1	1	2	2	2	2
Avg	2.3	3	2.6	3	3	1.6	1.6	1	2.6	2	1.6	1.6

Syllabus

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution
2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry - determination of redox potentials and emfs
11. Saponification/acid value of an oil
12. Chemical analysis of a salt
13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscosimeters to the demonstrate of the isoelectric pointas the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: **Choose 10 experiments from the above 15**

Books

1. Advance Practical Chemistry by Subhas C Das, Sarat Book House
2. A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel

BS-PH191: Physics Laboratory

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Observe and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity to apply basic knowledge Physics of Elasticity and apply viscosity principle of streamline motion of water to calculate its viscosity coefficient required in fluid mechanics.
CO2	Operate optical instruments to illustrate physical properties of light and to observe spectral lines of light to verify medium specific characteristics. Calculate Rydberg constant by studying Hydrogen spectrum to visualize visible spectra and to assess this empirical fitting parameter as a fundamental physical constant.
CO3	Determine Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different capacitors to correlate their usage like insulator and limitation of their usage as a dielectric material.

CO4	Determine Planck's constant and Stefan's constant applying modern Physics.

CO-PO Mapping

CO–PO Mapping BS-PH191 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	3	-	-	2	-	3	-	-	3
CO2	3	3	3	3	-	-	2	-	3	-	-	3
CO3	3	3	3	3	-	-	3	-	3	-	-	3
CO4	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**
AVG	**3**	**3**	**2.67**	**3**	**-**	**-**	**2.33**	**-**	**3**	**-**	**-**	**3**

Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism

4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseulle's capillary flow method

ES-EE191: Basic Electrical Engineering

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Identify different instruments and cut section of different machine
CO2	Describe the steady -state and transient behavior of RLC circuits.
CO3	Calculate the power of 3-ph system by two wattmeter
CO4	Analyze different characteristics of transformer & DC machines

CO-PO Mapping

Co & PO Mapping ES-EE191 to PO attainment

COs	PROGRAM OUTCOMES(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	2	2	2	-	3	-	2	-	-	3
CO2	3	2	2	2	2	-	3	-	2	-	-	3
CO3	3	2	2	2	2	-	3	-	2	-	-	3

CO4	3	2	2	2	2	-	3	-	2	-	-	3
AVG	**3**	**2**	**2**	**2**	**2**	**-**	**3**	**-**	**2**	**-**	**-**	**3**

Syllabus (ES-EE191)

Name of the Experiment Performed:

1. First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting

down list of experiments to be performed, and instruction for writing the laboratory reports by the

students. Group formation. Students are to be informed about the modalities of evaluation.

2. Introduction and uses of following instruments:

(a) Voltmeter

(b) Ammeter

(c) Multimeter

(d) Oscilloscope

Demonstration of real life resistors, capacitors with colorcode , inductors and autotransformer.

3. Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous

machine and single phase induction machine.

4. Calibration of ammeter and Wattmeter.

5. Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in

voltage.

6. Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of

impedance and power factor.

7. Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.

8. (a) Open circuit and short circuit test of a single-phase transformer

(b) Load test of the transformer and determination of efficiency and regulation

9. Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts

between the primary and secondary side.

10. Measurement of power in a three phase unbalanced circuit by two wattmeter method.

11. Determination of Torque –Speed characteristics of separately excited DC motor.

12. Determination of Torque speed characteristics and observation of direction reversal by change of

phase sequence of connection of Induction motor.

13. Determination of operating characteristics of Synchronous generator.

14. Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for

speed control of an Induction motor

15. Demonstration of components of LT switchgear

ES-ME191: Engineering Graphics & Design

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Demonstrate engineering scales, dimensioning, and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface, and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO4	Apply computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-Mapping

Co & PO Mapping ES-ME191 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	2	-	-	-	-	2	2
CO2	2	2	3	2	2	-	-	-	-	-	2	2
CO3	2	3	3	2	3	2	-	-	-	-	2	3
CO4	3	2	2	2	2	2	-	-	-	-	2	2
AVG	**2.5**	**2.5**	**2.5**	**2.00**	**2.25**	**2**	**-**	**-**	**-**	**-**	**2**	**2.25**

Syllabus (BS-M101)

INTRODUCTION TO ENGINEERING DRAWING
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES
Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archemedian Spiral.

PROJECTION OF POINTS, LINES, SURFACES

Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

COMBINATION OF REGULAR SOLIDS, FLOOR PLANS

Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

ISOMETRIC PROJECTIONS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

ANNOTATIONS, LAYERING & OTHER FUNCTIONS

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)

Books

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House

2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

6. Corresponding set of CAD Software Theory and User Manuals

ES-ME191: Workshop/ Manufacturing

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Identify and operate various hand tools related to variety of manufacturing operations
CO2	Fabricate simple components with their own hands.
CO3	Apply practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO4	Produce small devices of their interest in project or research purpose.

CO-PO Mapping

Co & PO Mapping ES-ME191 to PO attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	2	-	-	-	-	2	2
CO2	2	3	3	2	2	2	-	-	-	-	2	2
CO3	3	2	2	2	2	2	-	-	-	-	2	3
CO4	2	3	3	2	2	2	-	-	-	-	2	2
AVG	**2.5**	**2.5**	**2.5**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2.25**

Syllabus (ES-ME191)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining,advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical &Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

(ii) Workshop Practice:

Machine shop

Typical jobs that may be made in this practice module: To make a pin from a mild steel rod in a lathe. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Fitting shop

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Carpentry

Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module: ARC WELDING

To join two thick (approx 6mm) MS plates by manual metal arc welding.
GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module:
One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module*:*
A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

Typical jobs that may be made in this practice module*:*
For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.

Electrical & Electronics

Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Books

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop
2. Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited,Mumbai.
3. 2. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
4. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education,2008.

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

2st Semester/1st Yr

BS-CH201: Chemistry-I

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of molecules
CO2	Rationalise bulk properties and processes using thermodynamic considerations
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO4	Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.

CO-PO Mapping

Co & PO Mapping BS-CH201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	2	3	2	1	2	1	1	2	2
CO2	3	3	3	2	3	3	-	1	1	-	-	3
CO3	3	3	3	3	2	2	2	1	2	3	3	1
CO4	3	3	3	3	1	3	1	-	1	-	1	1
Avg	2.75	3	3	2.5	1.5	2.25	1.33	1.33	1.25	2.0	2.0	1.75

Syllabus(BS-CH201)

Unit I: Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H_2). Energy level diagrams of diatomic. π-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Unit II: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering

Unit III: Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Unit IV: Use of free energy in chemical equilibria

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Unit V: Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Unit VI: Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Unit VII: Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Books

Learning Resources:

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Physical Chemistry, by P. W. Atkins
4. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
5. Physical Chemistry, P. C. Rakshit, Sarat Book House
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

BS-PH201: Physics

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.
CO2	Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.
CO3	Learn the application of wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser
CO4	Learn Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.

CO-PO Mapping

CO–PO Mapping BS-PH201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	1	2	-	-	2	1	2
CO 2	3	3	3	2	2	1	2	-	-	2	1	2
CO 3	3	3	3	3	2	1	2	-	-	2	1	2
CO 4	3	3	3	2	2	1	2	-	-	2	1	2

Syllabus

UNIT 1. Mechanics

Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function F = -grad V, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.

UNIT 2. Optics

Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulae only), characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double reflection, scattering of light, circular and elliptical polarization, optical activity.

Lasers: Principles and working of laser – population inversion, pumping, various modes, threshold population inversion with examples

UNIT 3. Electromagnetism and Dielectric Magnetic Properties of Materials

Maxwell's equations, Polarization, permeability and dielectric constant, polar and non-polar

Dielectrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.

Magnetization: permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT 4. Quantum Mechanics

Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

UNIT 5. Statistical Mechanics

Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Books

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola, Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill

10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
14. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
15. Optics , Hecht, Pearson Education
16. Optics, Ghatak, McGraw Hill Education India Private Limited
17. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
18. Statistical Mechanics , Pathria , Elsevier
19. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

BS-M201: Mathematics - IIA

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO 1	Learn the ideas of probability and random variables, calculate probabilities using conditional probability, rule of total probability and Bayes' theorem.
CO 2	Illustrate the Various discrete and continuous probability distribution with their properties and their applications in physical and engineering environment.
CO 3	Understand the basic ideas of statistics with different characterization of a univariate and bivariate data set.
CO 4	Apply statistical tools for analyzing data samples and drawing inference on a given data set.

CO-PO Mapping

CO & PO Mapping BS-M201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	1	1	-	-	-	-	-	2
CO2	3	3	2	1	2	2	2	-	2	-	1	2
CO3	3	3	1	2	2	-	1	-	2	-	2	1
CO4	3	3	2	2	3	2	-	-	-	-	1	2
Avg	3	3	2.67	2.33	2.67	1.67	1.5	-	2	-	1.33	1.75

Syllabus (BS-M201)

Module 1: Basic Probability [11L]

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module 2: Continuous Probability Distributions [4L]

Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities.

Module 3: Bivariate Distributions [5L]

Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule.

Module 4: Basic Statistics [8L]

Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Module 5:Applied Statistics [8L]

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Module 6: Small samples [4L]

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Books

Learning Resources:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons

3. S. Ross, A First Course in Probability, Pearson Education India

4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.

5. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.

6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

7. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

HMHU 201: ENGLISH

Course Outcome (CO)

Student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO 1	Revise the basic grammar of English language.
CO 2	Learn appropriate use of English language to enhance knowledge on building vocabulary and framing sentences.
CO 3	Learn and incorporate sensible style in Technical writing.
CO 4	Acquire proficiency in English language for comprehensive excellence in reading, listening, writing and speaking.

CO-PO Mapping

Co & PO Mapping HMHU201 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	2	-	-	-	-	-	-	1	3	-	2
CO2	-	2	-	1	-	1	-	-	2	3	-	2
CO3	-	2	-	1	-	1	1	2	1	3	-	2
CO4	-	2	-	1	-	1	1	1	2	3	1	2
Avg	-	2	-	1	-	1	1	1.5	1.5	3	1	2

Syllabus (HMHU201)

Syllabus

MODULE I

Vocabulary Building 1.1

The concept of Word Formation: Compounding, Backformation, Clipping, Blending. 1.2 Root words from foreign languages and their use in English 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. 1.4 Synonyms, antonyms, and standard abbreviations: Acronyms

MODULE II

2. Basic Writing Skills 2.1 Sentence Structures & Types: Simple, Compound, Complex 2.2 Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration2.3 Importance of proper punctuation 2.4 Creating coherence: Arranging paragraphs & Sentences in logical order 2.5 Creating Cohesion: Organizing principles of paragraphs in documents 2.6 Techniques for writing precisely

MODULE III

3. Identifying Common Errors in Writing 3.1 Subject-verb agreement 3.2 Noun-pronoun agreement 3.3 Misplaced modifiers 3.4 Articles 3.5 Prepositions 3.6 Redundancies 3.7 Clichés

MODULE IV

4. Nature and Style of sensible Writing 4.1 Describing 4.2 Defining 4.3 Classifying 4.4 Providing examples or evidence 4.5 Writing introduction and conclusion

MODULE V

5. Writing Practices 5.1 Comprehension 5.2 Précis Writing 5.3 Essay Writing 5.4 Business Letter, Cover Letter & CV; E-mail

Books

Learning Resources:

1. Kulbushan Kumar, R S Salaria,Effective Communication Skills, Khanna Publishing House, Delhi.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
8. Universal English Prof. Prasad Kataria Publications, 2019.
9. "Communication Skills for Professionals"-NiraKonar, Prentice Hall of India 2nd edition, NewDelhi,2011.
10. Gajendra Singh Chauhan, SmitaKashiramka and L. Thimmesha. Functional English. Cengage, 2019.

ES-CS201: Programming for Problem Solving

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COs	CO Statement
CO1	Students will be able to describe the meaning of system of numbers, logic gates and the basic anatomy of a Computer.
CO2	Students will be able to understand the inherent meaning of the basic elements of C Programming Language like; constants, variables, operators, operator precedence etc., and identify the use of data types and C statements and classify the statements.
CO3	Students will be able to organize the statements in appropriate order to prepare a complete program that solves a specific problem and analyze a program to point out the bugs that might be present in it and change it to achieve the goal.
CO4	Students will be able to construct the final program and create the executable module for execution purpose.

CO-PO Mapping

CO & PO Mapping ES-CS201 to PO attainment

Programming for Problem Solving Programming												
CO'S	PO'S											
	PO 1	**PO 2**	**P O3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	_	_	3	2	1	_	2	3	1	_	2	2
CO2	1	3	2	2	_	2	_	3	2	3	2	2
CO3	3	2	1	2	_	2	3	2	2	2	2	3
CO4	3	2	3	3	2	2	2	1	2	2	3	_
Average	2.33	2.33	2.25	2.25	1.5	2.00	2.33	2.25	2.33	2.33	2.25	2.33

Syllabus (ES-CS201)

Unit 1: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code-

Unit 2: Arithmetic expressions and precedence

Unit 3: Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching

Unit 4: Arrays

Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 6: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Books

Learning Resources:

1. R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
2. 2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. 4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia

BS-PH291: Physics-I Lab

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Ability to increase power of observation and reasoning and to think and work with precision and accuracy in daily life. Use Slide callipers and screw gauge, familiar with concept of Band gap of semiconductor and dielectric constant
CO2	Get the opportunity to verify the validity of various laws taught in curriculum, Familiar with dispersive power of the material of a prism, Newton's ring, Planck constant
CO3	Familiar with Hall coefficient of a semiconductor Electron spin resonance spectrometer, Young's modulus, Poiseulle's capillary flow method for viscosity measurement.

CO-PO Mapping

CO–PO Mapping BS-PH291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	3	1	2	-	-	2	1	2
CO2	3	3	3	3	3	1	2	-	-	2	1	2
CO3	3	3	3	3	3	1	2	-	-	2	1	2

Syllabus

Experiments in Optics

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton’s ring
3. Determination of wavelength of a monochromatic light by Fresnel’s bi-prism
4. Determination of wavelength of the given laser source by diffraction method

Electricity & Magnetism experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson’s method.
3. Determination of dielectric constant of a given dielectric material.

4. Determination of Hall coefficient of a semiconductor by four probe method.
5. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge
8. Study of Transient Response in LR, RC and LCR circuits using expeyes
9. Generating sound from electrical energy using expeyes

Experiments in Quantum Physics

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section

3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseulle's capillary flow method

BS-CH291: Chemistry-I Lab

Course Outcome (CO)

On successful completion of the learning sessions of the course, the learner will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO 1	Use modern instrumentation and classical techniques like viscometer, stalagmometer, pH-meter, potentiometer and conductometer etc. to design experiments and to properly record the results of their experiments to achieve high accuracy.
CO 2	Separate the mixture of amino acids by TLC and analysis of chemical salts by qualitatively.
CO 3	Estimate the quantitative analysis of Dissolved oxygen, chloride ion and removal of hardness of water etc. which are required to determine the usability of water used in industries.
CO4	Understand the miscibility of solutes in various solvents required in paint, emulsion and material industries and determine the acid value of an oil, kinetics of oxidation of iodide by hydrogen peroxide.

CO-PO Mapping

CO & PO Mapping BS-CH291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	-	3	-	-	3	3	3	-
CO2	3	3	3	3	-	2	-	-	3	2	3	-
CO3	3	3	3	2	-	3	-	-	3	3	2	-
CO4	3	3	3	-	-	-	-	-	3	-	-	-
Avg	**3**	**3**	**3**	**2.6**	**-**	**2.6**	**-**	**-**	**3**	**2.6**	**2.6**	**-**

Syllabus

1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution
2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution
3. Determination of dissolved oxygen present in a given water sample.
4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5. Determination of surface tension and viscosity
6. Thin layer chromatography
7. Ion exchange column for removal of hardness of water
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry - determination of redox potentials and emfs
11. Saponification/acid value of an oil
12. Chemical analysis of a salt

13. Determination of the partition coefficient of a substance between two immiscible liquids
14. Adsorption of acetic acid by charcoal
15. Use of the capillary viscosimeters to the demonstrate of the isoelectric pointas the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

N.B.: **Choose 10 experiments from the above 15**

Books

1. Advance Practical Chemistry by Subhas C Das, Sarat Book House
2. A test book of Macro and Semimicro qualitative Inorganic Analysis by I. Vogel

HMHU 291: ENGLISH

Course Outcome (CO)

Student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Get introduced to professional application of English Language with emphasis on listening and speaking skills through language lab aids.
CO2	Practice sessions on pronunciation, intonation, voice modulation, stress, pitch and accent and developing communicative skills with special focus on Group Discussion.
CO3	Master effective reading and writing style through Language Lab aids.
CO4	Ensure proficiency in reading, listening comprehension, technical writing and in speaking.

CO-PO Mapping

CO & PO Mapping HMHU291 to PO attainment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	1	-	-	-	2	3	-	2
CO2	-	2	-	1	-	1	-	1	3	3	-	2
CO3	-	2	-	1	1	1	1	1	2	3	-	2
CO4	-	2	-	1	1	1	1	1	3	3	-	2
Avg	-	2	-	1	1	1	1	1	2.5	3	-	2

Syllabus (HMHU291)

1) Honing ‘Listening Skill’ and its sub skills through Language Lab Audio device; 3P

2) Honing ‘Speaking Skill’ and its sub skills 2P

3)Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/ Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech 2P

4) Honing ‘Conversation Skill’ using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone &Role Play Mode) 2P

5) Introducing ‘Group Discussion’ through audio –Visual input and acquainting them with key strategies for success 2P

6) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies &other soft skills) of GD 4P

7) Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non Technical Passages Learning Global / Contextual / Inferential Comprehension; 2P8) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions

ES-ME291: Engineering Graphics & Design

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
CO2	Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO3	Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine
CO4	Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

CO-PO-Mapping

CO & PO Mapping ES-ME291 to PO attainment

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	1	2	1	1	1	-	1	-	-	1
CO2	3	-	2	2	-	1	-	-	1	1	1	1
CO3	2	2	2	1	-	1	1	1	1	-	-	1
CO4	1	-	2	2	2	1	-	-	1	1	1	1

Syllabus (ES-ME291)

INTRODUCTION TO ENGINEERING DRAWING
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.

LETTERING, DIMENSIONING, SCALES
Plain scale, Diagonal scale and Vernier Scales.

GEOMETRICAL CONSTRUCTION AND CURVES

Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archemedian Spiral.

PROJECTION OF POINTS, LINES, SURFACES

Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.

PROJECTION OF REGULAR SOLIDS

Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).

COMBINATION OF REGULAR SOLIDS, FLOOR PLANS

Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

ISOMETRIC PROJECTIONS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

ANNOTATIONS, LAYERING & OTHER FUNCTIONS

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)

Books

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House

2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

6. Corresponding set of CAD Software Theory and User Manuals

ES-ME291: Workshop/ Manufacturing

On successful completion of the learning sessions of the course, the student will be able to:

CO1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2	Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
CO3	Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
CO4	Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO Mapping

Co & PO Mapping ES-ME291 to PO attainment

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	-	-	2	-	1	3	-	1	1
CO2	2	2	1	1	1	1	1	2	1	1	-	-
CO3	2	-	2	-	-	1	-	1	1	1	1	2
CO4	1	1	1	2	1	3	1	3	2	-	-	1

Syllabus (ES-ME291)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical &Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

(ii) Workshop Practice:

Machine shop

Typical jobs that may be made in this practice module:
To make a pin from a mild steel rod in a lathe.
To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Fitting shop

Typical jobs that may be made in this practice module: To make a Gauge from MS plate.

Carpentry

Typical jobs that may be made in this practice module:
To make wooden joints and/or a pattern or like.

Welding shop

Typical jobs that may be made in this practice module: ARC WELDING
To join two thick (approx 6mm) MS plates by manual metal arc welding.
GAS WELDING: To join two thin mild steel plates or sheets by gas welding

Casting

Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated.

Smithy

Typical jobs that may be made in this practice module: A simple job of making a square rod from a round bar or like.

Plastic moulding & Glass cutting

Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.

Electrical & Electronics

Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

ES-CS291: Programming for Problem Solving

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COs	CO Statement
CO1	Students will be able to define the specifications like input and output relating to a particular problem and describe the algorithm that solves the problem.
CO2	Students will be able to construct each of the modules of a program by restating the steps of the algorithm using functions in the framework of C language.
CO3	Students will be able to create the program by using the functions and execute the program.
CO4	Students will be able to point out the bugs if any, and modify the program to solve the problem.

CO-PO Mapping

Co & PO Mapping ES- CS 291 to PO attainment

Basic Computation & Principles of Computer Programming(CS291)												
CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	-	-	-	-	2	2
CO2	2	2	-	2		2	2	2		1	2	2
CO3	2	2	2	3	1	3	2	3	1	1	3	2
CO4	1	1	-	1	1	2	-	1	1	1	1	2
Avg	2	2	2	2	1.33	2.5	2	2	1	1	2	2

Syllabus (ES-CS291)

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Lab1: Familiarization with programming environment
Lab 2: Simple computational problems using arithmetic expressions
Lab 3: Problems involving if-then-else structures

Lab 4: Iterative problems e.g., sum of series
Lab 5: 1D Array manipulation
Lab 6: Matrix problems, String operations
Lab 7: Simple functions
Lab 8 and 9: Programming for solving Numerical methods problems
Lab 10: Recursive functions
Lab 11: Pointers and structures
Lab 12: File operations

3^{rd} Semester

ESC-301: Analog & Digital Electronics

Course Outcome (CO)

Student will be able to:

CO1	Students would be able to evaluate and analyze the circuit designing principles.
CO2	Students would be able to understand the operations of various combinational and sequential circuits.
CO3	Students would be able to design and implement both simple and complex analog and digital systems.

CO-PO Mapping

ESC-301: Analog & Digital Electronics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO 12
CO1	2	3			1	2	1	1	2			2
CO2		2	2		1	2		1	2	1		3
CO3	2	2			1		1	1		1		1
AVG	2	2.33	2		1	2	1	1	2	1		2

Syllabus (ESC-301)

Unit	Content	Hrs/Unit
1	Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency; Recapitulation of basic concepts of Feedback and Oscillation, Phase Shift, Wein Bridge oscillators Astable & Monostable Multivibrators; Schimtt Trigger circuits, 555 Timer.	9
2	Binary Number System & Boolean Algebra (recapitulation); BCD, ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra (recapitulation); Representation in SOP and POS forms; Minimization of logic expressions by algebraic method. Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De- Multiplexer and Parity Generator	11
3	Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO, SIPO, PIPO, PISO) Ring counter, Johnson counter. Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter.	10
4.	A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only [2L] A/D: successive approximation [2L]) Logic families- TTL, ECL, MOS and CMOS - basic concepts. (2L)	6

Books

1. Microelectronics Engineering –Sedra & Smith-Oxford.
2. Analog Electronics, A.K. Maini, Khanna Publishing House (AICTE Recommended -2018)
3. Analog Electronics, L.K. Maheswari, Laxmi Publications (AICTE Recommended -2018)
4. Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand
5. Digital Electronics – Kharate – Oxford
6. Digital Electronics – Logic & Systems by J.Bigmell & R.Donovan; Cambridge Learning.
7. Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP
8. Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI
9. Bell-Linear IC & OP AMP—Oxford
10. P.Raja- Digital Electronics- Scitech Publications
11. Morries Mano- Digital Logic Design- PHI
12. R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
13. H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.
14. D.RayChaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
15. Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
16. J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.
17. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill
18. Floyed & Jain- Digital Fundamentals-Pearson.

PCC-CS301: Data Structure & Algorithm

Course Outcome (CO)

Student will be able to:

CO1	Students will be able to understand the basic data structures and their applications.
CO2	Students will be able to apply Linear Data Structure that can be implemented using different data structures.
CO3	Students will be able to analyze the different sorting and searching algorithms mentioned in the course, their implementation and performance analysis.
CO4	Students will be able to construct and evaluate algorithms to solve a problem by choosing an appropriate data structure

CO-PO Mapping

Data Structure & Algorithm (PCC-CS301)

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	2				2	2	2	3	1	3
CO2		2		2			2	2			1	3
CO3	3	2	1	2				2	2	2		2
CO4	3	2	2	2			2		2	3	1	3
Avg	3	2.25	1.66	2			2	2	2		1	2.75

Syllabus (PCC-CS301)

Unit	Content	Hrs/Unit
1	Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space tradeoff. Searching: Linear Search and Binary Search Technique sand their complexity analysis.	10
2	Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.	9
3	Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis	10

4.	Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	**9**

Books

1. "Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung.
2. "Data Structure & Algorithms Using C", 5th Ed., Khanna Publishing House (AICTE Recommended – 2018)
3. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson- freed.
4. "Data Structures in C" by Aaron M. Tenenbaum.
5. "Data Structures" by S. Lipschutz.
6. "Data Structures Using C" by Reema Thareja.
7. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
8. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
9. "Data Structures through C" by Yashwant Kanetkar, BPB Publications.
10. "Expert Data Structures with C++" by R.B Patel, Khanna Publishing House

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

PCC-CS302: Computer Organization

Course Outcome (CO)

Student will be able to:

CO1	Analyze the designing process of combinational and sequential circuits.
CO2	Express arithmetic, logic and shift micro operations in symbolic form and their corresponding circuits at a register transfer level and apply it for the design and implementation of ALU.
CO3	Identify the addressing modes used in macro instructions and develop micro code for typical instructions in symbolic form.
CO4	Understand different input output devices and the control circuit.

CO-PO Mapping

Computer Organization (PCC-CS302)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	2		2	2	2		2	2	1			2
CO2	2	2						2		1		
CO3		2	2	2	1		2		1	1		2
CO4	2	2	2		1		2	2	1	1		2
Avg	2	2	2	2	1.3		2	2	1	1		2

Syllabus (PCC-CS302)

Unit	Content	Hrs/ Unit
1	Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. [7L] Commonly used number systems. Fixed and floating point representation of numbers.[1L]	8
2	Overflow and underflow. Design of adders - ripple carry and carry look ahead principles. [3L] Design of ALU. [1L] Fixed point multiplication -Booth's algorithm. [1L] Fixed point division - Restoring and non-restoring algorithms. [2L] Floating point - IEEE 754 standard. [1L]	8
3	Memory unit design with special emphasis on implementation of CPU-memory interfacing. [2L] Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L] Cache memory, Virtual memory. Data path design for read/write access. [5L]	10

4.	Design of control unit - hardwired and microprogrammed control. [3L] Introduction to instruction pipelining. [2L] Introduction to RISC architectures. RISC vs CISC architectures. [2L] I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]	10

Books

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Behrooz Parhami “Computer Architecture”, Oxford University Press
3. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
4. Hamacher, “Computer Organisation”, McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers” OUP
6. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
7. P N Basu- “Computer Organization & Architecture” ,Vikas Pub
8. Rajaraman – “Computer Organization & Architecture”, PHI
9. B.Ram – “Computer Organization & Architecture”, Newage Publications

BSC-301: Mathematics-III (Differential Calculus)

Course Outcome (CO)

On successful completion of the learning sessions of the course, the student will be able to:

COURSE OUTCOMES (COs)	
CODE	**DESCRIPTION**
CO1	Learn the methods for evaluating multiple integrals and their applications to different physical problems.
CO2	Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.
CO3	Learn the tools of power series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
CO4	Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points of different surfaces of higher dimensions.
CO5	Use tree and graph algorithms to solve problems

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3		1	2			2	2	2	1		
CO2		3					2		1	1		
CO3	3	3	1	2			2	2				
CO4		3	1	2				2	2	1		
CO5	3	3	1	2			2	2		1		
Avg	3	3	1	2			2	2	1.6	1		

Syllabus (BSC-301)

Unit	Content	Hrs/ Unit
1	Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.	8
2	Limit, continuity and partial derivatives, Chain rule, Implicit function, Jacobian, Directional derivatives, Total derivative; Maxima, minima and saddle points; Gradient, curl and divergence and related problems.	7
3	Double and triple integrals (Cartesian and polar),change of order of integration in double integrals, Change of variables (Cartesian to polar). Theorems of Green, Gauss and Stokes (Statement only) and related problems.	8
4.	First Order Differential Equation, Exact, Linear and Bernoulli's equations, Equations of first order but not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's form, general & singular solution. [5L] Second order linear differential equations with constant coefficients, D-operator method, method of variation of parameters, Cauchy-Euler equation. [4L]	9
5	Basic Concept of graph, Walk, Path Circuit, Euler and Hamiltonian graph, diagraph. Matrix Representation: Incidence & Adjacency matrix. Tree: Basic Concept of tree, Binary tree, Spanning Tree, Kruskal and Prim's algorithm for finding the minimal spanning tree.	**8**

Books

1. Higher Algebra, S. K. Mapa, Levant Books.
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd.
3. Co-ordinate Geometry, S. L. Loney
4. Integral Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
5. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
6. Advanced Engineering Mathematics, E Kreyszig
7. Advanced Engineering Mathematics, Chandrika Prasad & Reena Garg, Khanna Publishing House (AICTE Recommended Textbook - 2018)

HSMC-301: Economics for Engineers

Course Outcome (CO)

Student will be able to:

CO1	Make different economic decisions and estimate engineering costs by applying different cost estimation models.
CO2	Create cash flow diagrams for different situations and use different interest formulae to solve associated problems. Take decisions regarding different engineering projects by using various criteria like rate of return analysis, present worth analysis, cost-benefit analysis etc.
CO3	Incorporate the effect of uncertainty in economic analysis by using various concepts like expected value, estimates and simulation
CO4	Understand the concepts of depreciation, replacement analysis, scope of Finance and the role of financial planning and management, the process of inflation and use different price

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2		1		1			1	1	2	3	2
CO2	2	2			1				1	3		2
CO3	2		1		1			1		2	3	2
CO4	2	2	1					1	1	3	3	
Avg	2	2	1		1			1	1	2.5	3	2

Syllabus (PCC-CS301)

Unit	Content	Hrs/ Unit
1	1. Economic Decisions Making – Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	9

2	3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. 4. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	9
3	5. Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. 6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. 7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	**9**
4.	8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance	**9**

	Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. 9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. 10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	

Books

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

ESC-391: Analog & Digital Electronics

Course Outcome (CO)

Student will be able to:

CO1	Ability to design and implement both combinational and sequential circuits and to analyze their operations
CO2	Ability to solve engineering problems in digital system design.
CO3	Ability to design simple analog circuits and observe their performance.
CO4	Communicate effectively about laboratory work both orally and in writing technical reports.

CO-PO Mapping

Analog & Digital Electronics (ESC-391)												
COs	**PROGRAM OUTCOMES(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**
CO1	3	2	2		1	2	1	1	2	1		1
CO2		1	1			2	1		1			
CO3	3		2		1		1	1	2	1		1
CO4	3	2	1		1	2	1		2	1		1
AVG	3	1.6	1.5		1	2	1	1	1.75	1		1

Syllabus (ESC-391)

Laboratory Experiments:	
Analog Electronics	
1	Design a Class A amplifier
2	Design a Phase-Shift Oscillator
3	Design of a Schmitt Trigger using 555 timer
Digital Electronics	
4	Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
5	Construction of simple Decoder & Multiplexer circuits using logic gates.
6	Realization of RS / JK / D flip flops using logic gates
7	Design of Shift Register using J-K / D Flip Flop
8	Realization of Synchronous Up/Down counter
9	Design of MOD- N Counter
10	Study of DAC

PCC-CS391: Data Structure & Algorithm Lab

Course Outcome (CO)

Student will be able to:

CO1	Students will be able to Appreciate the importance of structure and abstract data type, and their basic usability in different applications
CO2	Students will be able to Analyze and differentiate different algorithms based on their time complexity.
CO3	Students will be able to Implement linear and non-linear data structures using linked lists.
CO4	Students will be able to Understand and apply various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.

CO-PO Mapping

Data Structure & Algorithm (PCC-CS391)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1	3		2	3			1	3	2	3	2	3
CO2	2	2	3				1	1		1	2	2
CO3		2		3					2	3		2
CO4		2	1	3			1	2	2		2	3
Avg	2.5	2	2	3			1	2	2	2.3	2	2.5

Syllabus (PCC-CS391)

Laboratory Experiments:	
Linear Data Structure	
1	Implementation of array operations
2	Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements
3	Merging Problem: Evaluation of expressions operations on Multiple stacks & queues:
4	Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists
5	Polynomial addition, Polynomial multiplication
Non Linear Data Structure	
6	Recursive and Non-recursive traversal of Trees
7	Threaded binary tree traversal. AVL tree implementation
8	Application of Trees. Application of sorting and searching algorithms
9	Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

PCC-CS392: Computer Organization

Course Outcome (CO)

Student will be able to:

CO1	To implement adder circuits using basic gates
CO2	To understand the converter circuits using basic gates.
CO3	To understand the working of Multiplexer
CO4	understand the various circuits for ALU, and control units

CO-PO Mapping

Computer Organization Lab (PCC-CS392)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2		2	2		2		2		2
CO2		2	2			2			2	2		
CO3	2		2		2				2			3
CO4	3	2			2			2		3		
Avg	2.3	2.3	2		2	2		2	2	2.3		2.5

Syllabus (PCC-CS392)

Laboratory Experiments:	
1	Familiarity with IC-chips: a) Multiplexer, b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification from Data-book.
2	Design an Adder/Subtractor composite unit.
3	Design a BCD adder.
4	Design of a 'Carry-Look-Ahead' Adder circuit.
5	Use a multiplexer unit to design a composite ALU
6	Use ALU chip for multibit arithmetic operation
7	Implement read write operation using RAM IC
8	8. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

PCC-CS393: IT Workshop (Sci Lab/MATLAB/Python/R)

Course Outcome (CO)

Student Will be able to:

CO1	To master an understanding of scripting & the contributions of scripting languages
CO2	Design real life problems and think creatively about solutions
CO3	Apply a solution in a program using R/Matlab/Python.
CO4	To be exposed to advanced applications of mathematics, engineering and natural sciences to program real life problems.

CO-PO Mapping

PCC-CS393: IT Workshop (Sci Lab/MATLAB/Python/R)												
CO'S	**PO'S**											
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1	3	2	2	3	1		2	2		3	1	3
CO2	2		2		1			2	2	2		2
CO3	2	2		3	1		2		2	2	1	3
CO4		3	2		1		2		2		1	2
Avg	2.3	2.3	2	3	1		2	2	2	2.3	1	2.5

Syllabus (PCC-CS393)

Programming in R

1.Introduction to mechanism for statistics, data analysis, and machine learning; Introduction of R Programming, How to install and run R, Use of R help files, R Sessions, R Objects – Vectors, Attributes, Matrices, Array, Class, List, Data Frames etc. Operators in R.

2.R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, R- Vector Function, Recursive Function in R.

3.R Packages (Install and Use), Input/Output Features in R, Reading or Writing in File. Data Manipulation in R. Rearranging data, Random Number and Simulation, Statistical methods like min, max, median, mean, length, Linear Regression, Normal Distribution, Decision tree

4.Graphics, Creating Graphs, The Workhorse of R Base Graphics, Graphical Functions – Customizing Graphs, Saving Graphs to Files, Pie chart, Bar Chart, Histogram.

Programming in Matlab

Introduction
Why MATLAB?, History, Its strengths, Competitors, Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB

Basics
Familiar with MATLAB windows, Basic Operations, MATLAB-Data types, Rules about variable names, Predefined variables

Programming-I
Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept

Programming-II
Script file, Input commands, Output commands, Structure of function file, Inline functions, Feval command, Comparison between script file and function file

Conditional statements and Loop
Relational and Logical Operators, If-else statements, Switch-case statements, For loop, While loop, Special commands (Break and continue), Import data from large database, Export data to own file or database

2D Plotting
In-built functions for plotting, Multiple plotting with special graphics, Curve fitting, Interpolation, Basic fitting interface

3D Plotting
Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics

Programming with Python Introduction

History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator

Conditional Statements
If, If- else, Nested if-else, Looping, For, While, Nested loops

Control Statements
Break, Continue, Pass

String Manipulation
Accessing Strings, Basic Operations, String slices, Function and Methods

Lists
Introduction, Accessing list, Operations, Working with lists, Function and Methods

Tuple

Introduction, Accessing tuples, Operations, Working, Functions and Methods

Dictionaries
Introduction, Accessing values in dictionaries, Working with dictionaries, Properties

Functions
Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables

Modules
Importing module, Math module, Random module, Packages, Composition, Input-Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions

Exception Handling
Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

Books

Text book and Reference books:

1. Dr. Jeeva Jose, Begineer's Guide for Data Analysis Using R Programming, Khanna Publishing House, New Delhi

4th Semester/2nd year

PCC-CS401: Discrete Mathematics

Course Outcome (CO)

Student will be able to:

CO1	Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
CO3	Classify its algebraic structure for a given a mathematical problem.
CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
CO5	Develop the given problem as graph networks and solve with techniques of graph theory.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2		3			2		2	1		3
CO2		2	1	2								2
CO3	2	2	1				2		1	1		2
CO4				2			2		2	1		
CO5	2		1							1		
Avg	2	2	1	2.3			2		1.6	1		2.3

Syllabus (*PCC-CS401*)

Unit	Content	Hrs/Unit
1	Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument andThe Power Set theorem, Schroeder-Bernsteintheorem. Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.	8
2	Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation andcombination	5
3	Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables,	8
	Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.	

4.	Algebraic Structures and Morphism: Algebraic structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form	7
5	Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.	8

Books

1. Russell Merris, Combinatorics, Wiley-Inter science series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH
5. J.K. Sharma, Discrete Mathematics, Macmillan

6. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
7. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
8. Douglas B. West, Introduction to graph Theory, PHI
9. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
10. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
11. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
12. N. Deo, Graph Theory, Prentice Hall of India, 1974.
13. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.

PCC-CS402: Computer Architecture

Course Outcome (CO)

Student will be able to:

CO1	Design basic and intermediate RISC pipelines, including the instruction set, data paths, and ways of dealing with pipeline hazards.
CO2	Understand various techniques of instruction-level parallelism, including superscalar execution, branch prediction, and speculation, in design of high-performance processors.
CO3	State and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.
CO4	Realize and compare properties of shared memory and distributed multiprocessor systems and cache coherency protocols.

CO-PO Mapping

Computer Architecture (PCC-CS402)												
CO'S	PO'S											
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO 1	3	2		2	2			3	3	2		2
CO 2		3		1			2	2	2	1		
CO 3	2	2		2	2		2	2	3	2		2
CO 4		2		1	2		2		2	1		2
Avg	2.5	2.25		1.5	2		2	2.3	2.5	1.5		2

Syllabus (PCC-CS402)

Unit	*Content*	*Hrs/ Unit*
1	Introduction: Review of basic computer architecture (Revisited), Quantitative techniques in computer design, measuring and reporting performance. (3L) Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques; Compiler techniques for improving performance. (9L)	*12*

2	Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies. (8L)	8
3	Instruction-level parallelism: basic concepts,techniques for increasing ILP, superscalar, super- pipelined and VLIW processor architectures. Arrayand vector processors. (6L)	6
4.	Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared- memory architecture. Cluster computers. (8L) Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures. (4L)	7

Books

1. V. Carl, G. Zvonko and S. G. Zaky, "Computer organization", McGraw Hill, *1978.*
2. B. Brey and C. R. Sarma, "The Intel microprocessors", Pearson Education, *2000.*
3. J. L. Hennessy and D. A. Patterson, "Computer Architecture A Quantitative Approach", *Morgan Kauffman, 2011*.
4. W. Stallings, "Computer organization",PHI, *1987.*
5. P. Barry and P. Crowley, "Modern Embedded Computing", Morgan Kaufmann, *2012.*
6. N. Mathivanan, "Microprocessors, PC Hardware and Interfacing", Prentice Hall, *2004.*

7. *Y. C. Lieu* and G. A. Gibson, "Microcomputer Systems: The 8086/8088 Family", Prentice *Hall India, 1986.*
8. J. Uffenbeck,"The 8086/8088 Design, Programming, Interfacing", Prentice Hall, *1987.*
9. B. Govindarajalu, "IBM PC and Clones", Tata McGraw Hill, 1991.
10. P. Able, "8086 Assembly Language Programming", Prentice Hall India6. Winfried Karl *Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.*
11. *Rajaraman* – "Computer Organization & Architecture", PHI
12. *B.Ram* – "Computer Organization & Architecture", Newage *Publications*

PCC-CS403: Formal Language & Automata Theory

Course Outcome (CO)

Student will be able to:

CO1	Students able to define and recognize the behaviour of a system.
CO2	Students able to check the equivalence between regular linear grammar and finite automata by the application of a number of proof techniques to theorems in language design

CO3	Student able to convert finite automata to regular expression after proper analyzation.
CO4	Students able to minimize context free grammar and hence can check the equivalence of CFL and PDA which ultimately leads to the proper evaluation of the acceptability of strings by the system.
CO5	Students able to design Turing machine that describes computation effectively and efficiently.

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CO-PO Mapping

Formal Language & Automata Theory (PCC-CS403)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1	3	2	1	2	2	2			2	2	1	2
CO2	2		1		2				1		1	
CO3	2	3		2		2			2	2		3
CO4	3	2	1	2	2	2				2	1	
CO5	2.5	2.3	**1**	**2**	2	2			1.6	2	1	2.5
Avg	3	2	1	2	2	2			2	2	1	2

Syllabus (PCC-CS403)

Unit	*Content*	*Hrs/Unit*
1	Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.	*6*

2	Regular languages and finite automata: Regular expressions and languages, eterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata)	*7*
3	Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL),Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic push down automata, closure properties of CFLs.	*6*
4.	Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.	6
5	Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable(recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMsas enumerators	6
6	Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between	6

	languages and Rice s theorem, undecidable problems about languages	

Books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
2. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory ofComputation, Pearson Education Asia.
3. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
4. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
5. John Martin, Introduction to Languages and The Theory of Computation, TataMcGraw Hill., PEARSON. Dr. R.B.Patel, Theory of Computation, Khanna Publishing House

PCC-CS404: Design and Analysis of Algorithms

Course Outcome (CO)

Student will be able to:

CO1	Students able to analyze and evaluate asymptotic performance of algorithms and write rigorous correctness proofs for algorithms

CO2	Students able to identify and explain familiarity of major algorithms and data structures.
CO3	Students able to apply important algorithmic design paradigms and methods of analysis.
CO4	Students able to synthesize efficient algorithms in common engineering design situations

CO-PO Mapping

DESIGN AND ANALYSIS OF ALGORITHM(PCC-CS404)

CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	3	2	3	1			2	1	2	1	2
CO2		2	2		1				1	2		2
CO3	2	3	2	3	1			2	1		1	
CO4	2	3		3				2		2	1	2
Avg	2	2.75	2	3	1			2	1	2	1	2

Syllabus (PCC-CS404)

Unit	Content	Hrs/Unit
1	Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem	8
2	Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.	8
3	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm. Tractable and Intractable Problems: Computability	6
4.	of Algorithms, Computability classes – P,NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.	10
5	Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	4

Books

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
5. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley,Reading, MA
6. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House (AICTE Recommended Textbook – 2018)
7. Algorithms Design and Analysis, Udit Agarwal, Dhanpat Rai

BS-BSC-401: Biology

Course Outcome (CO)

Student will be able to:

CO1	Describe how biological observations of 18th Century that lead to major discoveries. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
CO2	Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
CO3	Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Classify enzymes and distinguish between different mechanisms of enzyme action.
CO4	Identify DNA as a genetic material in the molecular basis of information transfer. Analyse biological processes at the reductionistic level. Apply thermodynamic principles to biological systems.
CO5	Identify and classify microorganisms.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2		2	1		2			1	1		2
CO2		2		1		3			2			2
CO3	2	2		1		2			1	1		1
CO4	2	2	2	1					2			1
CO5		2	2			2			1	1		1
Avg	2	2	2	1		2.25			1.4	1		1.4

Syllabus (BS-BSC-401)

Unit I: Introduction to biology

To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Unit II: Classification

The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure-prokaryotes or eucaryotes. (c energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Unit III: Genetics

To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Unit IV: Biomolecules

To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA.Two carbon units and lipids.

Unit V: Enzymes

To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Unit VI: Information transfer

The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA 4 Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly West Bengal University of Technology) Syllabus for B. Tech in Information Technology (Applicable from the academic session 2018-2019) 12 PG structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Unit VII: Macromolecular analysis

How to analyse biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Unit VIII: Metabolism

The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keqand its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

Unit IX: Microbiology

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Books

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers
6. Biology for Engineers, McGraw Hill (ISBN: 978-11-21439-931)

MC-401:Environmental Science

Course Outcome (CO)

Student will be able to:

CO1	To understand the natural environment and its relationships with human activities
CO2	To apply the fundamental knowledge of science and engineering to assess environmental and health risk
CO3	To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations
CO4	Acquire skills for scientific problem-solving related to air, water, noise& land pollution

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2		1		2	2	3	3	2	2		2
CO2	2		1	2	3	3		3	1		1	2
CO3				2	2	2	3	3	1	2	1	
CO4	2		1	2	3	3	3	2	1	2	1	2
Avg	2		1	2	2.5	2.5	3	2.75	1.25	2	1	2

Syllabus (MC-401)

Unit-I

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, nonrenewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function.

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; anthropogenic degradation like Acid rain cause, effects and control. Nature and scope of Environmental Science and Engineering.

Unit-II

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem-components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

Unit-III

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as

albedo], Problems. Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.
Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).
Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.
Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN.
Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green-house gases, effect of ozone modification.
Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

Unit-IV
Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.
River/Lake/ground water pollution: River: DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH.
Lake: Eutrophication [Definition, source and effect].
Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)
Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.
Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

Unit-V
Lithosphere; Internal structure of earth, rock and soil
Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Unit-VI
Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]
Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level

Unit-VII
Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/agreement/ protocol.

Books

1. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House (AICTE Recommended Textbook – 2018)
2. Masters, G. M., “Introduction to Environmental Engineering and Science”, Prentice-Hall of India Pvt. Ltd.,1991.
3. De, A. K., “Environmental Chemistry”, New Age International

PCC-CS492: Computer Architecture Lab

Course Outcome (CO)

Student will be able to:

CO1	Describe the fundamental organization of a computer system
CO2	Explain the functional units of a processor
CO3	Explain addressing modes, instruction formats and program control statements
CO4	Distinguish the organization of various parts of a system memory hierarchy

CO-PO Mapping

(Computer Architecture Lab (PCC-CS492))												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		3	2	3	2			2	3		3
CO2		2		2	2		3		3	2		
CO3	2	2	2	3	3				2	3		3
CO4	2	2			2	3	3		2	3		3
AVG	2	2	2.5	2.3	2.5	2.5	3		2.25	2.75		3

Syllabus (PCC-CS492)

Laboratory Experiments:	
1	HDL introduction.
2	Basic digital logic base programming with HDL
3	8-bit Addition, Multiplication, Division
4	8-bit Register design
5	Memory unit design and perform memory operations.
6	8-bit simple ALU design
7	8-bit simple CPU design
8	Interfacing of CPU and Memory.

PCC-CS494 : Design & Analysis Algorithm

Course Outcome (CO)

Student will be able to:

CO1	Analyze the asymptotic performance of algorithms.
CO2	Write rigorous correctness proofs for algorithms.
CO3	Demonstrate a familiarity with major algorithms and data structures
CO4	Apply important algorithmic design paradigms and methods of analysis.

CO-PO Mapping

PCC-CS494 : Design & Analysis Algorithm												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	3			2	3	3		3
CO2		3	3	3				2		3		2
CO3	2		3	3				2	3			3
CO4	3	2	2	3	3				3	3		
Avg	2.6	2.6	2.75	3	3			2	3	3		2.6

Syllabus (PCC-CS494)

Laboratory Experiments:	
Divide and Conquer:	
1	Implement Binary Search using Divide and Conquer approach Implement Merge Sort using Divide and Conquer approach
2	Implement Quick Sort using Divide and Conquer approach Find Maximum and Minimum element from a array of integer using Divide and Conquer approach
3	Find the minimum number of scalar multiplication needed for chain of matrix
4	Implement all pair of Shortest path for a graph (Floyed-Warshall Algorithm) Implement Traveling Salesman Problem
5	Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford

	Algorithm
Brunch and Bound:	
6	Implement 15 Puzzle Problem
Backtracking:	
7	Implement 8 Queen problem
8	Graph Coloring Problem Hamiltonian Problem
Greedy method	
9	Knapsack Problem Job sequencing with deadlines
10	Minimum Cost Spanning Tree by Prim's Algorithm Minimum Cost Spanning Tree by Kruskal's Algorithm
Graph Traversal Algorithm:	
11	Implement Breadth First Search (BFS)
12	Implement Depth First Search (DFS)

5^{th} Semester

ESC501: Software Engineering

Course Outcome (CO)

Student Will be able to:

CO1	Students will be able to outline the features of different lifecycle models.
CO2	Students will be able to explain the principals involved in gathering software requirements
CO3	Students will be able to illustrate quality assurance procedures with verification and validation during software development
CO4	Students will be able to Make use of suitable models through analysis of requirements and arrive at an appropriate software design.

CO-PO Mapping

Software Engineering (ECS501)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	2	-	-	3	-
CO2	-	3	1		3	-	-	3	3	2	-	-
CO3	3	-	2		-			-	2	-	1	3

CO4	3	3	3		3			3	1	2	3	2
Avg	3	2.67	2	-	3	-	-	2.67	2	2	2.33	2.5

Syllabus (ECS501)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. [10L]	10	
2	System Design – Context diagram and DFD, Problem Partitioning, Top-Down And Bottom-Up design; Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. [5L]	5	
3	Coding & Documentation – Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation. [4L] Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment, Validation & Verification, Metrics, Monitoring & Control. [8L]	12	

4.	Software Project Management – Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. [7L]	7	
5	Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, Sequence diagram, state chart diagram, activity diagram, implementation diagram. [10 L]	10	

Books

Text book and Reference books:

1. Pressman, Software Engineering : A practitioner's approach– (TMH)
2. Pankaj Jalote, Software Engineering- (Wiley-India)
3. N.S. Gill, Software Engineering – (Khanna Publishing House)
4. Rajib Mall, Software Engineering- (PHI)
5. Agarwal and Agarwal, Software Engineering – (PHI)
6. Sommerville, Software Engineering – Pearson
7. Martin L. Shooman, Software Engineering – TMH

PCC-CS501 : Compiler Design

Course Outcome (CO)

Student will be able to:

CO1	Students relate and understand lexical analyzer and parser generator tools
CO2	Students use to build symbol table along with the generation of intermediate code followed by assembly code
CO3	Students analyze the working principle of both Top-Down and Bottom-Up parsers followed by the implantation of semantic rules into a parser that performs attribution while parsing
CO4	Students prioritize on understanding of compiler architecture, memory allocation and compiler optimization.

CO-PO Mapping

Compiler Design (PCC-CS501)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	1		3	2	3				2	-	3	_
CO2	2	2	3	2	2			2	2	-		2
CO3	3		3	2	2			-	2	3		2
CO4	_	_	3	2				3	2	3		2
Avg	2	1.5	3	2	2.4	-	-	2.5	2	3	-	2

Syllabus (PCC-CS501 : Compiler Design)

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction to Compiling** [3L] Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.	3	
2	**Lexical Analysis** [6L] The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, Finite Automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).	6	
3	**Syntax Analysis** [9L] The role of a parser, Context free Grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR,LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.		
4	**Syntax directed translation** [5L] Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.	5	
5	**Type checking** [4L] Type systems, Specification of a simple type checker, Equivalence of type expressions, Typeconversions	4	
6	**Run time environments** [5L] Source language issues (Activation trees, Controlstack, scope of declaration, Binding of names),Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameterpassing (call by	5	

	value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.		
7	**Intermediate code generation** [4L] Intermediate languages, Graphical Representation,Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).	4	
8	**Code optimization** [5L] Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representationof basic blocks, The principle sources of optimization, Loops in flowgraph, Peephole optimization.	5	
9	**Code generations** [4L] Issues in the design of code generator, a simple code generator, Register allocation & assignment.	4	

Books

Text book and Reference books:

1. Aho, Sethi, Ullman - “Compiler Principles, Techniques and Tools” - Pearson Education.
2. Holub - “Compiler Design in C” - PHI.

PCC-CS502 : Operating Systems

Course Outcome (CO)

Student Will be able to:

CO1	Students will be able to understand the role and responsibilities of OS in the computer system and analyze the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.
CO2	Students will be able to identify the dead lock situation and provide appropriate solution so that protection & security of the operating system is also maintained.
CO3	Students will be able to analyze memory management techniques, concepts of virtual memory and disk scheduling
CO4	Students will be able to understand the implementation of file systems and directories along with the interfacing of IO devices with the operating system.

CO-PO Mapping

PCC-CS502 : Operating Systems												
CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12
CO1	3	3	2			2		-	-	-	1	2
CO2	2	2	-			2		3		3	1	
CO3	2		2			2		3	2	3	1	

CO4	1		-			2		2	2	3	1	3
Avg	2	2.5	2	-	-	2	-	2.67	2	3	1	2.5

Syllabus (PCC-CS502)

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction:** Concept of Operating Systems,Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.	3	
2	**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching **Thread**: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, **Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.	10	

3.	**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors,Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.	5	
4.	**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	5	
5.	**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation– Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation –Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory Hardware and control structures Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently	8	
6.	**I/O Hardware:** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms **File Management**: Concept of File, Access	6	

	methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. **Disk Management:** Disk structure, Disk scheduling -FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks		

Books

Text book and Reference books:

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

3. Operating System Concepts, Ekta Walia, Khanna Publishing House (AICTE Recommended Textbook – 2018)

4. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing

5. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison- Wesley

6. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

7. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

PCC-CS503 : Object Oriented Programming

Course Outcome (CO)

Student Will be able to:

CO1	Students able to relate and understand the basic Object Oriented concepts.
CO2	Students learn to solve problem statements by applying Object Oriented Programming concepts.
CO3	Students categorize the implementation of various features of object oriented programming according to real world problems.
CO4	Students able to assess the pros and cons of each feature of object oriented programming
CO5	Students able to design different application based software tools.

CO-PO Mapping

PCC-CS503 : Object Oriented Programming

CO'S	PO'S											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	2	2	3	3	_			_	2	3		
CO2	_	2		_	_			2	3	3		_
CO3	3	2		3	3			_	2	_		3
CO4	_	2	2	3	_			_	3	3		2
CO5		2		_	3			2	3	3		
Avg	2.5	2	2.5	3	3	-	-	2	2.6	3	-	2.5

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

Syllabus (PCC-CS503)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Abstract data types and their specification. How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementing operations, illustrated by the Text example.	8	
2	Features of object-oriented Programming. Encapsulation, object identity, polymorphism – but not inheritance.	8	
3	Inheritance in OO design. Design patterns. Introduction and classification. The iterator pattern.	6	
4	Model-view-controller pattern, Commands as methods and as objects. Implementing OO language features, Memory management.	6	
5	Generic types and collections GUIs. Graphical programming with Scale and Swing .The software development process	6	

Books

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

HSMC-501 : Introduction to Industrial Management

Course Outcome (CO)

Student will be able to:

CO1	Interpret given organization structure, culture, climate and major provisions offertories and laws.
CO2	Explain material requirement planning and store keeping procedure.
CO3	Plot and analyze inventory control models and techniques.
CO4	Prepare and analyze CPM and PERT for given activities. List and explain PPC functions.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		3				1						2
CO2	2		2								3	2
CO3	2	2				2					3	2
CO4		2	2									2
Avg	2	2.33	2	-	-	1.5	-				3	2

Syllabus (HSMC-501)

Unit	Content	Hrs/ Unit	Marks /Unit
1	**Introduction** System- concept, definition, types, parameters, variables and behavior. Management – definition andfunctions. Organization structure: • Definition. • Goals. • Factors considered in formulating structure. • Types. • Advantages and disadvantages. • Applications. Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation ofauthority, centralization and decentralization in industrial management. Organizational culture and climate –meaning, differences and factors affecting them. Moral-factors affecting moral. Relationship between moral and productivity. Job satisfaction- factors influencing job satisfaction. Important provisions of factory act andlabor laws.	6	
2	**Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT):** CPM & PERT-meaning, features, difference, applications. 2.2 Understand different terms used in network diagram. Draw network diagram for a real lifeproject containing 10-15 activities, computation of LPO and EPO.(Take minimum three examples).	8	

	Determination of critical path on network. Floats, its types and determination offloats. Crashing of network, updating and its applications.		
3	**Materials Management:** Material management-definition, functions, importance, relationship with other departments. Purchase - objectives, purchasing systems, purchase procedure, terms andforms used in purchase department. Storekeeping- functions, classification of stores as centralized and decentralized with their advantages, disadvantages and application in actual practice. Functions of store, types of records maintained by store, various types and applications of storage equipment, need and general methods for codification ofstores. Inventory control: i. Definition. ii. Objectives. iii. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. iv. ABC analysis and other modern methods of analysis. Various types of inventory models such as Wilson's inventory model, replenishment model and two bin model.(Only sketch and understanding, no derivation.). 3.6 Material Requirement Planning (MRP)- concept, applications and brief details about software packages availablein market.	6	
4	**Production planning and Control(PPC):** Types and examples of production. PPC : i. Need and importance. ii. Functions. iii. Forms used and their importance. iv. General approach foreach type of production. Scheduling- meaning and need forproductivity and utilisation. Gantt chart- Format and method toprepare.	8	

	Critical ratio scheduling-method and numeric examples. Scheduling using Gantt Chart (for atleast 5-7 components having 5-6 machining operations, with processes, setting and operation time for each component and process, resources available, quantity and other necessarydata), At least two examples. 4.7 Bottlenecking- meaning, effect and ways to reduce.		
5	**Value Analysis (VA) and Cost Control:** 5.1 VA-definition, terms used, process and importance. 5.2 VA flow diagram. DARSIRI method of VA. Case study of VA-at least two. Waste-types, sources and ways to reduce them. Cost control-methods and important guide lines.	4	
6	**Recent Trends in IM:** ERP (Enterprise resource planning) - concept, features and applications. Important features of MS Project. Logistics-concept, need and benefits. Just in Time (JIT)-concept and benefits. Supply chain management-concept and benefits.	4	

Books

Text book and Reference books:

1. L.S. Srinath– "CPM & PERT principles and Applications".
2. Buffa – "Modern Production Management".
3. N. Nair – "Materials Management".
4. O. P. Khanna – " Industrial Engineering & Management".
5. Mikes – "Value Analysis".
6. S.C. Sharma, "Engineering Management – Industrial Engineering & Management",Khanna Book Publishing Company, New Delhi

PEC-IT501A : Theory of Computation

Course Outcome (CO)

Student will be able to:

CO1	Students able to define and recognize the behaviour of a system.
CO2	Students able to check the equivalence between regular linear grammar and finite automata by the application of a number of proof techniques to theorems in language design.
CO3	Student able to convert finite automata to regular expression after proper analyzation.
CO4	Students able to minimize context free grammar and hence can check the equivalence of CFL and PDA which ultimately leads to the proper evaluation of the acceptability of strings by the system.
CO5	Students able to design Turing machine that describes computation effectively and efficiently.

CO-PO Mapping

PEC-IT501A : Theory of Computation

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2	_	_	_	3	2	2	_	_	2	_	2
CO2	3	2	3	_	_	_	_	_	1	_	1	2
CO3	2	3	2	3		_	_	_	2	_	_	3
CO4	_	2	_	_	2	_	2	2	2	_	_	_
CO5	3	_	2	_	3	2	3	3	_	_	2	3
Avg	2.5	2.3	2.3	3.0	2.6	2.0	2.3	2.5	1.6	2.00	1.50	2.50

Syllabus (PEC-IT501A)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model [2L] Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept [1L] Merger graph, Merger table, Compatibility graph [1L] Finite memory definiteness, testing table & testing graph. [1L] Deterministic finite automaton and non-deterministic finite automaton.[1L] Transition diagrams and Language recognizers. [1L] Finite Automata: NFA with Î transitions - Significance, acceptance oflanguages. [1L] Conversions and Equivalence: Equivalence between NFA with andwithout Î transitions. NFA to DFA conversion. [2L] Minimization of FSM, Equivalence between two FSM's , Limitationsof FSM [1L] Application of finite automata, Finite Automata with output- Moore & Melay machine. [2L]	13	

2	Regular Languages : Regular sets. [1L] Regular expressions, identity rules. Arden's theorem state and prove[1L] Constructing finite Automata for a given regular expressions, Regularstring accepted by NFA/DFA [1L] Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). [1L] Grammar Formalism: Regular grammars-right linear and left linear grammars. [1L] Equivalence between regular linear grammar and FA. [1L]Inter conversion, Context free grammar. [1L] Derivation trees, sentential forms. Right most and leftmost derivationof strings. (Concept only) [1L]	8	
3.	Context Free Grammars, Ambiguity in context free grammars. [1L]Minimization of Context Free Grammars. [1L] Chomsky normal form and Greibach normal form. [1L]Pumping Lemma for Context Free Languages. [1L] Enumeration of properties of CFL (proofs omitted). Closure propertyof CFL, Ogden's lemma & its applications [1L] Push Down Automata: Push down automata, definition. [1L] Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. [1L] Equivalence of CFL and PDA, inter conversion. (Proofs not required).[1L] Introduction to DCFL and DPDA. [1L]	9	
4.	Turing Machine : Turing Machine, definition, model [1L]Design of TM, Computable functions [1L] Church's hypothesis, counter machine [1L] Types of Turing machines (proofs not	5	

	required) [1 L]Universal Turing Machine, Halting problem [2L]		

Books

Text book and Reference books:

1. "Introduction to Automata Theory Language and Computation", Hopcroft H.E. andUllman J. D., Pearson education.
2. "Theory of Computation", R.B Patel, Khanna Publishing House, New Delhi
3. "Theory of Computer Science ", Automata Languages and computation", Mishra andChandra shekaran, 2nd edition, PHI.
4. "Formal Languages and Automata Theory", C.K.Nagpal, Oxford
5. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
6. "Introduction to Computer Theory", Daniel I.A. Cohen, John Wiley
7. "Introduction to languages and the Theory of Computation", John C Martin, TMH
8. "Elements of Theory of Computation", Lewis H.P. & Papadimitrou C.H. Pearson, PHI.

PEC-IT501B : Artificial Intelligence

Course Outcome (CO)

Student will be able to:

CO1	Explain artificial intelligence, its characteristics and its application areas.
CO2	Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.
CO3	Select and apply appropriate algorithms and AI techniques to solve complex problems.
CO4	Design and develop an expert system by using appropriate tools and techniques.

CO-PO Mapping

PEC-IT501B : Artificial Intelligence												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2					2	3	3	3	1	2
CO2	3	3	1				2	2	2	2	1	3
CO3		3	2				1	-	2	-	1	3
CO4	2		2				1	3	1	1	1	
Avg	2.33	2.67	1.67	-	-	-	1.5	2.67	2	2	1	2.67

Syllabus (PEC-IT501B)

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction [2]** Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. **Intelligent Agents [2]** Agents & environment, nature of environment, structure of agents,goal based agents, utility based agents, learning agents. **Problem Solving [2]** Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.	6	
2.	**Search techniques [5]** Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search,bidirectional search, comparing uniform search strategies. **Heuristic search strategies [5]** Greedy best-first search, A* search, memory bounded heuristic search:local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. **Adversarial search [3]** Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.	13	

3	**Knowledge & reasoning [3]** Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledgerepresentation.	3	
4	**Using predicate logic [2]** Representing simple fact in logic, representing instant & ISArelationship, computable functions & predicates, resolution, natural deduction. **Probabilistic reasoning [4]** Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.	6	
5	**Natural Language processing [2]** Introduction, Syntactic processing, semantic analysis, discourse &pragmatic processing. **Learning [2]** Forms of learning, inductive learning, learning decision trees,explanation based learning, learning using relevance information, neural net learning & genetic learning. **Expert Systems [2]** Representing and using domain knowledge, expert system shells,knowledge acquisition.	6	

Books

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS
7. M.C. Trivedi, Artificial Intelligence, Khanna Publishing House, New Delhi(AICTERecommended Textbook – 2018)

PEC-IT501C : Advanced Computer Architecture

Course Outcome (CO)

Student will be able to:

CO1	Describe the designing principles of pipelines
CO2	Explain different types of processor used in a computer.
CO3	Classify different categories of memory and operations performed by them
CO4	Explain different computer architectures and assess the performance of a computer

CO-PO Mapping

PEC-IT501C : **Advanced Computer Architecture**

CO'S	PO'S											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	-	2	-	2	-	-	2-	-
CO2	2	3	2	1	3	3	2	3	2	-	-	2
CO3	1	2	3	1	3	2	1	2	3	2	3	2
CO4	1	2	2	3	2	-	-	-	-	1	2	3
Avg	1.75	2.25	2.00	1.50	2.67	2.33	1.50	2.33	2.50	1.50	2.50	2.33

Syllabus (PEC-IT501C)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Computer Architecture and Organization-Review, Fundamentals ofComputer Design, Technology Trends Cost Performance Analysis (3L) Parallel Processing Architectures Taxonomy- SISD,SIMD ,MIMD, PRAM models(3L) SISD,MISD,SIMD,MIMD, PRAM models (3L)	6	
2.	Data and Resource Dependencies, Program Partitioning and Scheduling, Control Flow vs. Data Flow (3L) Network topologies-Static, Dynamic, Types of Networks (3L) RISC vs. CISC, Memory Hierarchy, Virtual Memory (4L)	10	
3	Concepts of Pipelining, Instruction Pipelining, dynamic pipelining, arithmetic pipelines. (4L) Multiprocessors- Multistage Networks, Cache Coherence, Synchronization, Message- passing (4L) Vector Processing Principles- Instruction types, Compound, Vector Loops, Chaining (4L)	12	
4	Array Processors- Structure, Algorithms (3L) Data Flow Architecture- Graphs. Petri Nets, Static and Dynamic DFA, VLSI Computations (4L) Parallel Programming Models, Languages, Compilers (4L)	11	

Books

Text book and Reference books:

1. Computer Architecture and Parallel Processing- Kai Hwang and A. Brigggs InternationalEdition, McGraw Hill
2. Advanced Computer Architecture: D. Sima, T. fountain, P. Kacsuk, Pearson
3. Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

PEC-IT501D : Computer Graphics

Course Outcome (CO)

Student will be able to:

CO1	Learn comprehensive introduction about computer graphics system, design algorithms and two-dimensional transformations.
CO2	Familiar with techniques of clipping, three-dimensional graphics, and three-dimensional transformations.
CO3	Perform designing, developing, and testing of modeling, rendering, shading and animation.

CO-PO Mapping

PEC-IT501D **: Computer Graphics**												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	2	3	3		3		2	3	3		3	1
CO2	2	3	2		1	2	2	3	2			2
CO3	2	3	2	2	2		2	3	2	2	3	3
Avg	2.00	3.00	2.33	2.00	2.00	2.00	2.00	3.00	2.33	2.00	3.00	2.00

Syllabus (PEC-IT501D : Computer Graphics)

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction to computer graphics & graphics systems [6L]:** Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, look up table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software. **Scan conversion[8L]:**Points &lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.	14	
2	**2D transformation & viewing [15L]:** Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; Reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Suther land line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method3D	20	

	transformation & viewing [5L]: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through anarbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing. **Curves[3L]:**Curve representation, surfaces, designs, Bezier curves,		
3.	B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves. **Hidden surfaces[3L]:**Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire framemethods, fractal-geometry. **Color & shading models [2L]:** Light & color model; interpolative shading model; Texture. **Introduction to Ray-tracing:[3L]** Human vision and color, Lighting, Reflection and transmission models.	6	

Books

Text book and Reference books:

1. Hearn,Baker –"ComputerGraphics(Cversion2ndEd.)"–Pearsoneducation
2. Z.Xiang,R.Plastock–"Schaum'soutlinesComputerGraphics(2ndEd.)"–TMH
3. D.F. Rogers,J.A.Adams–"MathematicalElementsforComputerGraphics(2ndEd.)"–TMH

MC-CS501 : Constitution of India

Course Outcome (CO)

Student will be able to:

CO1	Develop human values, create awareness about law ratification and significance of Constitution
CO2	Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values, and their social responsibilities.
CO3	Create understanding of their Surroundings, Society, Social problems, and their suitable solutions.
CO4	Familiarize with distribution of powers and functions of Local Self Government.
CO5	Realize the National Emergency, Financial Emergency, and their impact on Economy of the country.

CO-PO Mapping

CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	3	2	-	-	-	-	-
CO4	2	-	-	-	-	1	-	-	3	-	-	2
CO5	-	-		-	-	-	-	2	3	2	-	2
Avg	2	-	-	-	-	2	2	2	3	2	-	2

Syllabus (MC-CS501)

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction:** Constitution meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	3	
2	**Union Government andits Administration:** Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	6	
3.	**State Government and its Administration Governor:** Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions	6	
4.	**Local Administration District's Administration head:** Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different4.departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy	8	
5.	**Election Commission Election Commission:** Role and Functioning, Chief Election	4	

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

Books

Text book and Reference books:

1. ‘Indian Polity’ by Laxmikanth
2. ‘Indian Administration’ by Subhash Kashyap
3. ‘Indian Constitution’ by D.D.Basu
4. ‘Indian Administration’ by Avasti and Avasti

ESC591 : Software Engineering Lab

Course Outcome (CO)

Student will be able to:

CO1	To understand the software engineering methodologies involved in the phases for project development.
CO2	Choose appropriate process model depending on the user requirements.
CO3	Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
CO4	Apply the knowledge, techniques, and skills in the development of a software product

CO-PO Mapping

ESC591 : Software Engineering Lab												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	-	2	-	3	-	-	1	3	2	1	-
CO2	2	3	2	-	-	-	-	2	3	3	1	-
CO3	2	1	1	-	-	-		-	3	3	-	3
CO4	3	2	1	-	2	-	-	2	3	3	1	3
Avg	2.5	2	1.5	-	2.5	-	-	1.67	3	2.75	1	3

Syllabus (ESC591)

Unit	Content	Hrs/Unit	Marks /Unit
1	Problem Analysis and Project Planning - Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.		
2	Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.		
3	Data Modeling – Use work products – data dictionary.		
4	Software Designing - Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.		
5	Prototype model – Develop the prototype of the product.		

Books

1. Mastering Uml with Rational Rose by Wendy Boggs (Wiley India Private Limited)

2. Rational Rose Essentials: Using the Booch Method by by Iseult White (Benjamin-Cummings Publishing Company, Subs of Addison Wesley Longman,)

PCC-CS592 : Operating System Lab

Course Outcome (CO)

Student will be able to:

CO1	Students will be able to understand the role and responsibilities of OS in the computer system and analyze the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.
CO2	Students will be able to identify the dead lock situation and provide appropriate solution so that protection & security of the operating system is also maintained.
CO3	Students will be able to analyze memory management techniques, concepts of virtual memory and disk scheduling.
CO4	Students will be able to understand the implementation of file systems and directories along with the interfacing of IO devices with the operating system.

CO-PO Mapping

PCC-CS592 : Operating System Lab

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2	-	2	-	-	-	-	3	-	3	-	-
CO2	2	-	2	-	-	2	-	2	2	3	-	-
CO3	-	1	2	-	-	2	-	-	2	3	-	3
CO4	2	2	2	-	-	-	-	3	2	3	-	2
Avg	2	1.5	2	-	-	2	-	2.67	2	3	-	2.5

Syllabus (PCC-CS592)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Managing Unix/Linux Operating System [8P]: Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and Methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users &user groups.	8	
2	Process [4P]: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.	4	

3	Signal [4P]: signal handling, sending signals, signal interface, signal sets.	4	
4	Semaphore [6P]: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).	6	
5	POSIX Threads [6P]: programming with pthread functions (viz.pthread_create,pthread_join,pthread_exit,pthread_attr_init, pthread_cancel)	6	
6	Inter-process communication [6P]: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO), message passing & shared memory(IPC version V).	6	

Books

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5thEdition, William Stallings, Prentice Hall of India.
3. Operating System Concepts, Ekta Walia, Khanna Publishing House (AICTE Recommended Textbook –2018)
4. Operating System: A Design- oriented Approach,1st Edition by Charles Crowley, Irwin Publishing
5. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
6. Design of the Unix Operating Systems, 8thEditionby Maurice Bach, Prentice-Hall of India
7. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex
JIS GROUP

Department of Computer Science and Engineering

PCC-CS593 : Object Oriented Programming Lab

Course Outcome (CO)

Student will be able to:

CO1	Students able to relate and understand the basic Object Oriented concepts.
CO2	Students learn to solve problem statements by applying Object Oriented Programming concepts.
CO3	Students categorize the implementation of various features of object oriented programming according to real world problems.
CO4	Students able to assess the pros and cons of each feature of object oriented programming.
CO5	Students able to design different application based software tools.

CO-PO Mapping

PCC-CS593 : Object Oriented Programming Lab

CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	-	-	-	-	2	3	-	3
CO2	-	3	2	-	-	-	-	2	3	3	-	-
CO3	2	3	3	3	3	-	-	-	2	-	-	3
CO4	-	2	3	3	-	-	-	-	3	3	-	2
CO5	2	2	3	-	3	-	-	2	3	3	-	-
Avg	2	2.6	2.8	3	3	-	-	2	2.6	3	-	2.67

Syllabus (PCC-CS593)

Unit	Content	Hrs/Unit	Marks /Unit
1	Assignments on class, constructor, overloading, inheritance, overriding		
2	Assignments on wrapper class, arrays		
3	Assignments on developing interfaces-multiple inheritance, extending interfaces		
4	Assignments on creating and accessing packages		
5	Assignments on multithreaded programming		
6	Assignments on applet programming		

Books

Text book and Reference books:

1. Ali Bahrami–"Object Oriented System Development"–Mc Graw Hill
2. Patrick Naughton, Herbert Schildt–"Thecompletereference-Java2" –TMH
3. R.K Das–"Core Java For Beginners"–VIKASPUBLISHING
4. Deitel and Deitel–"Java How to Program" –6th Ed. –Pearson
5. Ivor Horton's Beginning Java 2SDK–Wrox
6. E.Balagurusamy–"Programming With Java: A Primer"–3rdEd.–TMH
7. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall,India

3rd Yr/6th Semester

PCC-CS601: Database Management Systems

Course Outcome (CO)

Student will be able to:

CO1	Students relate a problem at view level and outline the different level of abstractions of the database to handle data.
CO2	Students implement the logic by using (data modeling) tools like ERD.
CO3	Students analyze by normalizing the database to understand the interrelated data and respective dependencies.
CO4	Students assess the importance of cost-optimized query statements.
CO5	Students extract data more efficiently after having a clear understanding of transaction system.

CO-PO Mapping

Data Base Management System (CS601)												
CO'S	PO'S											
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2
CO1	2	2	-	-	-	-	-	2	-	1	1	-
CO2	-	-	2	-	1	-	-	-	1	-	2	2
CO3	1	3	-	-	-	-	-	2	2	1	2	2

CO4	3	2	2	-	-	-	-	-	2	-	2	3
CO5	3	2	-	-	2	-	-	-	2	-	3	-
Average	2.25	2.25	2	-	1.5	-	-	2	1.75	1	2	2.33

Syllabus (PCC-CS601)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.	9	

2	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. **Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	13	
3	**Storage strategies:** Indices, B-trees, hashing.	3	
4	**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi- version and optimistic Concurrency Control schemes, Database recovery.	5	
5	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	3	
6	**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	3	

Books

1. "Database System Concepts" , 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan,McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. Database Management Systems, R.P. Mahapatra, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
4. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe.
5. Pearson Education "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

PCC-CS602: Computer Networks

Course Outcome (CO)

Student will be able to:

CO1	Students will be able to describe the components of data communication system and the purpose of layered architecture.
CO2	Students will be able to explain and illustrate the application of each layer of OSI and TCP/IP reference model.
CO3	Students will be able to explain different protocols.
CO4	Students will be able to assess the functions of different layers.

CO-PO Mapping

Computer Networks (CS602)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	-	-	-	2	2	-	-	-	-	-	2
CO2	3	3	-	2	1	2	-	3	-	2	-	1
CO3	2	3	-	-	3	1	-	3	-	-	-	2
CO4	2	2	-	2	-	2	-	2	3	2	-	-
Average	2.5	2.67	-	2	2	1.75	-	2.67	3	2	-	1.67

Syllabus (PCC-CS602)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Data communication Components:** Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	9	
2	**Data Link Layer and Medium Access Sub Layer:** Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted LOHA,CSMA/CD,CDMA/CA.	8	
3	**Network Layer:** Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	14	
4	**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	8	
5	**Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.	8	

Books

1. Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House, New Delhi.

PEC-IT601 A: Advanced Algorithms

Course Outcome (CO)

Student will be able to:

CO1	Analyze the complexity/performance of different algorithms.
CO2	Determine the appropriate data structure for solving a particular set of problems.
CO3	Categorize the different problems in various classes according to their complexity.
CO4	Students should have an insight of recent activities in the field of the advanced data structure.

CO-PO Mapping

Advanced Algorithms (PEC-IT601 A)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	_	_	1	1	1	_	1
CO2	2	3	3	1	1	_	2	_	_	_	_	_
CO3	2	2	1	3	_	1	_	_	_	1	_	_
CO4	2	2	1	1	3	2	_	1	1	_	1	1
Average	2.25	2.5	1.75	1.75	1.67	1.5	2.0	1.0	1.0	1.0	1.0	1.0

Syllabus (PEC-IT601 A)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Sorting:** Review of various sorting algorithms, topological sorting **Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	6	
2	**Matroids:** Introduction to greedy paradigm, algorithm to compute a	8	

	maximum weight maximal independent set. Application to MST.		
	Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.		
	Flow-Networks: Maxflow-mincut theorem, Ford- Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.	9	
3	**Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. **Modulo Representation of integers/ polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm	10	

4.	**Linear Programming:** Geometry of the feasibility region and Simplex algorithm **NP-completeness:** Examples, proof of NP-hardness and NP-completeness. **One or more of the following topics based on time and interest** Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm	10	
5	Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	5	

1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House, New Delhi.

PEC-IT601 B: Distributed Systems

Course Outcome (CO)

Student will be able to:

CO1	Students able to relate basics of Distributed Systems and its components with respect to Distributed Database management system.
CO2	Analyze the complexity/performance of different algorithms in the field of distributed system.

CO3	Determine the appropriate data structure for solving problems related to distributed systems and categorize them in various classes according to their complexity.
CO4	Students should have an insight of recent activities in the field of the distributed system.

CO-PO Mapping

Distributed Systems (PEC-IT601 B)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	-	1	-	-	-	1	-	2
CO2	2	3	2	2	1	1	-	-	-	-	-	-
CO3	2	2	3	1	1	1	-	1	-	-	-	-
CO4	-	-	-	-	-	1	-	1	2	1	-	2
Average	2	2	2.33	1.33	1	1	-	1	2	1	-	2

Syllabus (PEC-IT601 B)

Unit	Content	Hrs/Unit	Marks/Unit

1	**INTRODUCTION** Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts **DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE** Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues	8	
2	**DISTRIBUTED DATABASE DESIGN** Alternative design strategies; Distributed design issues; Fragmentation; Data allocation **SEMANTICS DATA CONTROL** View management; Data security; Semantic Integrity Control QUERY **PROCESSING ISSUES** Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data	11	

3	**DISTRIBUTED QUERY OPTIMIZATION** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms **TRANSACTION MANAGEMENT** The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models **CONCURRENCY CONTROL** Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management	11	
4.	Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols Algorithm	8	
5	**PARALLEL DATABASE** SYSTEMS Parallel architectures; parallel query processing and	6	
6	**ADVANCED TOPICS Mobile** Databases, Distributed Object Management, Multi-databases	4	

Books

1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
2. Distributed Database Systems, D. Bell and J. Grimson, Addison- Wesley, 1992.

PEC-IT601 C: Signals & Systems

Course Outcome (CO)

Student will be able to:

CO1	Identify the classification of signals in terms of periodic-aperiodic, even – odd, energy-power, Deterministic-random, complex exponential, sinusoidal signals, unit impulse and unit step.
CO2	Determine the mathematical operation on signals and systems using time scaling, time shifting, linearity, causality, time invariance, stability, convolution theorem and Fourier series coefficient with Dirichlet's conditions.
CO3	Discriminate different spectrum analysis techniques and its analysis and characteristics on LTI system using Fourier transform.
CO4	Analyze the Z-transform with the help of properties of ROC, Poles and Zeros, inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion.
CO5	Understand the application of sampling theorem, types of sampling, reconstruction of a signal from its samples, aliasing effect and the effect of random variable with its properties like distribution & density functions, mean values & moments, concepts of correlation, random processes.

CO-PO Mapping

Signals & Systems (PEC-IT601 C)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	_	_	1	1	_	_	_	1	1
CO2	2	3	2	2	_	1	1	1	_	_	2	1
CO3	2	3	2	2	2	1	_	1	2	1	2	1
CO4	2	2	1	2	2	1	1	1	2	1	2	1
CO5	2	1	1	2	_	2	2	1	2	1	2	2
Average	2.2	2.2	1.4	2.0	2.0	1.2	1.25	1.0	2.0	1.0	1.8	1.2

Syllabus (PEC-IT601 C)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Introduction to Signals and Systems :** Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	3	
2	**Behavior of continuous and discrete-time LTI systems (8 hours)** Impulse response and step response, convolution, input-output behavior with periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi- output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.	8	

3	**Fourier, Laplace and z- Transforms** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	10	
4.	The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero- order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	9	

Books

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, “ Signalsand systems”, Prentice Hall India,1997.
2. J. G. Proakis and D. G. Manolakis, “ Digital Signal Processing: Principles, Algorithms, and Applications” , Pearson,2006.
3. H. P. Hsu, “Signals and systems”, Schaum’sseries, McGraw Hill Edition, 2010.
4. S. Haykinand B. V. Veen, “ Signals and Systems”, John Wiley and Sons,2007.
5. A. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.
6. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
7. B. P. Lathi, “ LinearSystems and Signals”, Oxford University Press,2009.
8. R. Anand, “Signals and Systems, Khanna Publishing House, 2018.

PEC-IT601 D: Image Processing

Course Outcome (CO)

Student will be able to:

CO1	Develop a theoretical foundation of fundamental concepts of image processing.
CO2	Understand the mathematical foundations for image representation, image acquisition, image transformation, and image enhancement.
CO3	Realize the mathematical principles of image restoration, image compression, and image segmentation

CO-PO Mapping

Image Processing (PEC-IT601 D)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	1	1	_	_	_	_	2	2
CO2	_	3	3	_	3	2	2	2	2	_	2	_
CO3	2	_	_	_	_	_	_	2	2	2	1	_
Average	2.5	2.5	2.5	1.0	2.0	1.5	2.0	2.0	2.0	2.0	1.67	2.0

Syllabus (PEC-IT601 C)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Introduction [3L]** Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	9	
2	**Digital Image Formation [4L]** A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	4	
3	**Mathematical Preliminaries[9L]** Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.	9	

4.	**Image Enhancement [8L]** Spatial Domain Method, Frequency Domain Method, Contrast Enhancement - Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High- pass Filtering, High- boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	8	
5	**Image Restoration [7L]** Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.	7	
6	**Image Segmentation [7L]** Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	7	

Books

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education.
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH.
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH.

PEC-IT602 A: Parallel and Distributed Algorithms

Course Outcome (CO)

Student will be able to:

CO1	Study software components of distributed computing systems. Know about the communication and interconnection architecture of multiple computer systems.
CO2	Recognize the inherent difficulties that arise due to distributed-ness of computing e-sources.
CO3	Understanding of networks & protocols, mobile & wireless computing, and their applications to real world problems.
CO4	Familiar with the design, implementation, and security issues of distributed system.

CO-PO Mapping

Parallel and Distributed Algorithms (PEC-IT602 A)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	3	_	_	_	_	_	2	_
CO2	2	2	_	2	_	2	2	1	2	1	_	_
CO3	2	_	_	_	2	3	3	_	_	_	3	3
CO4	2	2	1	_	_	_	_	2	1	2	2	2
Average	2.0	2.0	1.0	1.5	2.5	2.5	2.5	1.5	1.5	1.5	2.34	2.5

Syllabus (PEC-IT602 A)

Unit	Content	Hrs/Unit	Marks/Unit
1	**UNIT-I :**Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing	8	
2	**UNIT-II :**Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples	8	
3	UNIT-III :Pipelining- Techniques computing platform, pipeline programs examples	8	

4.	**UNIT-IV:** Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelism sharing data parallel programming languages and constructs, open MP	11	
5	**UNIT-V :**Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.	9	

Books

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2nd Edition.
2. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

PEC-IT602 B: Data Warehousing and Data Mining

Course Outcome (CO)

Student will be able to:

CO1	Understand the basic principles, concepts and applications of data warehousing and data mining.
CO2	Realize Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
CO3	Acquire a good knowledge of the fundamental concepts that provide the foundation of data mining.
CO4	Learn recent trends in Distributed Warehousing and Data Mining.

CO-PO Mapping

Data Warehousing and Data Mining (PEC-IT602 B)

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	-	-	-	-	-	2	1	-	-	-
CO 2	2	2	-	3	1	1	-	-	-	-	-	2
CO 3	-	-	-	-	2	-	-	1	2	2	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-
Avg	2	1.5	-	3	1.5	1	-	1.5	1.5	2	-	2

Syllabus (PEC-IT602 B)

Unit	Content	Hrs/Unit	Marks/Unit
1	**Unit 1:** Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;	8	
2	**Unit 2:** Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,	8	
3	**Unit 3:** Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;	8	
4.	**Unit 4:** Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis; modulation for communication, filtering, feedback control systems.	11	

	Unit 5: Web Mining, Mining the web page layout structure, mining web link structure, Mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.	9	
	Unit 6: Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.	5	

Books

1. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India.
2. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill Education.
3. Data warehouse Toolkit by Ralph Kimball, Wiley India.
4. Data Mining & Warehousing by Ikvinderpal Singh, Khanna Publishing House.
5. Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
6. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
7. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

8.

PEC-IT602 C: Human Computer Interaction

Course Outcome (CO)

Student will be able to:

CO1	Differentiate between various software vulnerabilities.
CO2	Software process vulnerabilities for an organization.
CO3	Monitor resources consumption in a software.
CO4	Interrelate security and software development process.

CO-PO Mapping

Human Computer Interaction (PEC-IT602 C)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	3	3	_	3	_	_	1	_	_	2	_
CO2	_	_	3	_	_	3	_	3	_	3	_	2
CO3	–	–	–	2	3	2	_	2	–	–	–	–
CO4	2	3	_	3	_	2	3	3	2	2	3	3
Average	2.0	3.0	3.0	2.5	3.0	2.34	3.0	2.25	2.0	2.5	2.5	2.5

Syllabus (PEC-IT602 C)

Unit	Content	Hrs/Unit	Marks/Unit
1	Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	9	
2	Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.	11	
3.	Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.	8	
4.	Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.	8	
5.	Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.	8	
6.	Recent Trends: Speech Recognition and Translation, Multimodal System	3	

Books

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett.
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

PEC-IT602 D: Pattern Recognition

Course Outcome (CO)

Student will be able to:

CO1	Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
CO2	Apply support vector machines, regularized regression algorithms & machine learning toolboxes.
CO3	Understand the concept behind neural networks for learning non-linear functions & foundation of generative models.
CO4	Understand and apply unsupervised algorithms for clustering.
CO5	Realize the inference and learning algorithms for the hidden Markov model with latent variables.
CO6	Acquire knowledge of algorithms for learning Bayesian networks & reinforcement learning algorithms.

CO-PO Mapping

Pattern Recognition (PEC-IT602 C)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	1	_	_	_	_	_	_	_	2	_
CO2	_	_	3	_	3	2	_	_	_	_	2	2

CO3	2	2	–	3	–	–	–	2	3	1	2	–
CO4	2	2	–	2	3	3	–	2	3	2	3	3
CO5	–	–	2	3	–	2	3	–	–	–	2	–
CO6	–	3	2	2	–	–	3	–	–	–	2	2
Average	2.0	2.25	2.0	2.5	3.0	2.34	3.0	2.0	3.0	1.5	2.17	2.34

Syllabus (PEC-IT602 D)

Unit	Content	Hrs/Unit	Marks/Unit
1	Basics of pattern recognition	2	
2	**Bayesian decision theory 8L** Classifiers, Discriminant functions, Decision surfaces Normal density and discriminant functions Discrete features	8	
3	**Parameter estimation methods 6L** Maximum-Likelihood estimation Gaussian mixture models Expectation-maximization method Bayesian estimation	6	
4.	**Hidden Markov models for sequential pattern classification 8L** Discrete hidden Markov models Continuous density hidden Markov models	8	
5	**Dimension reduction methods 3L** 5.1. Fisher discriminant analysis 5.2Principal component analysis. Parzen-window method K-Nearest Neighbour method	3	

6	Non parametrictechniquesfor density estimation	2	
7	**Linear discriminant function based classifier 5L** Perceptron Support vector machines	5	
8	**Non-metric methods for pattern classification 4L** Non-numeric data or nominal data Decision trees	4	
9	**Unsupervised learning and clustering 2L** Criterion functions for clustering Algorithms for clustering: K-means, Hierarchical and other methods	2	

Books

1. R. O. Duda, P. E. Hart and D. G. Stork: Pattern Classification, John Wiley, 2001.
2. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

OEC-IT601 A: Numerical Methods

Course Outcome (CO)

Student will be able to:

CO1	Develop numerical methods for approximately solving problems.
CO2	Examine the accuracy of these methods
CO3	Examine the failure modes of these methods
CO4	Demonstrate knowledge and understanding of numerical methods to solve systems of linear equations, to compute quadratures and to solve Ordinary and Partial Differential Equations

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1	2	-	-	-	-	-	1	-	2
CO2	3	3	1	2	-	-	-	2	2	-	2	2
CO3	3	3	1	2	-	-	-	2	2	-	2	2
CO4	3	3	1	2	-	-	-	-	-	-	2	2
Avg	3	3	1	2	-	-	-	2	2	1	2	2

Syllabus (OEC-IT601 A)

Unit	Content	Hrs/ Unit	Marks /Unit
1	Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.	2	
2	Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.	8	
3	Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.	3	
4	Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.	8	
5	Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.	3	
6	Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	2	

Books

1. R. S. Salaria: Computer Oriented Numerical Methods, Khanna Publishing House.
2. C. Xavier: C Language and Numerical Methods.
3. Dutta & Jana: Introductory Numerical Analysis.
4. J. B. Scarborough: Numerical Mathematical Analysis.
5. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

OEC-IT601 B: Human Resource Development and Organizational Behavior

Course Outcome (CO)

Student will be able to:

CO1	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization and the applicability of analyzing the complexities associated with management of individual behavior in the organization.
CO2	Analyze the complexities associated with management of the group behavior in the organization. Analyze how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.
CO3	Develop the understanding of the concept of human resource management and to understand its relevance in organizations and necessary skill set for application of various HR issues.
CO4	Analyze the strategic issues and strategies required to select and develop manpower resources.
CO5	Integrate the knowledge of HR concepts to take correct business decisions.

CO-PO Mapping

Human Resource Development and Organizational Behavior (OEC-IT601 B)	
CO'S	**PO'S**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	_	3	_	2	2	3	_	_	_	2	2
CO2	3	3	1	2	1	2	3	3	_	2	2	1
CO3	2	3	_	_	3	1	2	3	_	3	2	2
CO4	2	2	3	2	_	2	2	2	3	2	_	_
CO5	_	_	2	3	_	_	_	3	2	_	3	2
Average	2.50	2.67	2.00	2.34	2.00	1.75	2.50	2.75	2.50	2.34	2.25	1.75

Syllabus (OEC-IT601 B)

Unit	Content	Hrs/ Unit	Marks/ Unit
1	Organizational Behavior: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. **[2]** Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	4	
2	Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. **[2]** 4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.	8	

3	Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. **[2]** Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. **[2]** Leadership: Definition, Importance, Theories of Leadership Styles.	4	
4.	Organizational Politics: Definition, Factors contributing to Political Behaviour. **[2]** Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. **[2]** Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.	8	

Books

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI.
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

PROJ-CS 601: Research Methodology

Course Outcome (CO)

Student will be able to:

CO1	Explain the meaning, objective, motivation, approaches, components, and significance of research.
CO2	Review the exhaustive literature critically, differentiate between Research Method and Research Methodology, develop the working hypothesis, and formulate the research problem.
CO3	Understand the need for research design, concepts relating to research design and principles of experimental and simulated designs.
CO4	Determine the important sample designs and collect appropriate data through various techniques.
CO5	Analyze the collected data by appropriate techniques and carry out hypothesis testing.
CO6	Prepare the report or thesis in a scholarly manner.

CO-PO Mapping

Research Methodology (PROJ-CS 601)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	-	-	-	-	-	2	2	3	2	3	-
CO2	-	2	-	3	-	-	-	-	-	-	3	3

CO3	2	3	-	-	3	-	2	-	-	-	3	3
CO4	2	3	-	-	-	-	-	-	2	2	3	-
CO5	2	-	-	3	2	-	-	3	3	-	3	-
Average	2	2.67	-	3	2.5	-	2	2.5	2.67	2	3	3

Syllabus (PROJ-CS 601)

Unit	Content	Hrs/Unit	Marks/Unit
1	**RESEARCH FORMULATION AND DESIGN** Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.	9	

2	**DATA COLLECTION AND ANALYSIS** Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools,data analysis with statically package (Sigma	9	
	STAT, SPSS for student t-test,ANOVA, etc.), hypothesis testing.		
3	**RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING** Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.	9	
4.	**INTERPRETATION AND REPORT WRITING** Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Project Report, Layout of the Project/Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Project/Research Report, Precautions for Writing Research Reports, Conclusions.	9	

Books

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Carlos, C.M., 2000. Intellectual propertyrights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.

PCC-CS691: Database Management System Lab

Course Outcome (CO)

Student will be able to:

CO1	Students write and outline the creation and modification of structures of multi-table relational databases using DDL commands.
CO2	Students use to manipulate (insert, delete and update) data using DML commands.
CO3	Students analyze SQL queries to retrieve selected data from multiple tables according to the need of the user of the database (nested queries, aggregate functions etc.).
CO4	Students evaluate different queries by cost and generate different reports using SQL.
CO5	Students construct database application programs considering the issues like concurrency control of transactions, recovery and security.

CO-PO Mapping

Database Management System Lab (PCC-CS691)												
CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2	3	1	2	-	-	-	2	-	3	-
CO 2	2	-	3	1	2	-	-	-	-	-	3	-
CO 3	2	-	-	1	2	-	-	-	2	-	3	2
CO 4	2	-	3	1	3	-	-	-	2	-	3	3
CO 5	2	1	-	1	3	-	-	-	2	-	3	3
Avg	2	1.5	3	1	2.4	-	-	-	2	-	3	2.67

Syllabus (PCC-CS691)

Structured Query Language

1 **Creating a Database**

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. **Table and Record Handling**

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

3. **Retrieving Data from a Database**

a. The SELECT statement

b. Using the WHERE clause c. Using Logical Operators in the WHERE clause d. Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING clause e. Using aggregate function f. Combining Tables Using JOINS g. Subqueries
4. **Database Management** • Creating Views • Creating Column Aliases • Creating Database Users • Using GRANT and REVOKE

PCC-CS692: Computer Networks Lab

Course Outcome (CO)

Student will be able to:

CO1	Understand fundamental underlying principles of computer networking.
CO2	Understand details and functionality of layered network architecture.
CO3	Apply mathematical foundations to solve computational problems in computer networking.
CO4	Analyze performance of various communication protocols.

CO-PO Mapping

Computer Networks Lab (PCC-CS692)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	-	2	1	3	3	-	3
CO2	2	1	2	1	1	-	2	3	2	-	-	1
CO3	2	-	2	-	3	-	2	3	2	1	-	3
CO4	3	3	2	3	-	-	3	-	2	3	-	-
Average	2.25	2.33	2	2.33	2.38	-	2.25	2.33	2.25	2.33	-	2.33

Syllabus (PCC-CS692)

1) NIC Installation & Configuration (Windows/Linux)
2) Understanding IP address, subnet etc.
   Familiarization with
   - Networking cables (CAT5, UTP)
   - Connectors (RJ45, T-connector)
   - Hubs, Switches
3) TCP/UDP Socket Programming
   - Simple, TCP based, UDP based
   - Multicast & Broadcast Sockets
   - Implementation of a Prototype Multithreaded Server

4) Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window) Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check) Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)	
5) Server Setup/Configuration FTP, TelNet, NFS, DNS, Firewall	

4th Yr/7th Semester

PEC-CS701A: Quantum Computing

Course Outcome (CO)

Student will be able to:

CO1	Identify Matrices, Quantum state, Density operator and Quantum states.
CO2	Interpret matrices & operators used for quantum computing.
CO3	Apply commutator algebra and tensor products in determination of quantum states.
CO4	Analyze the recent developments in quantum measurement theory and applications.

CO-PO Mapping

PEC-CS701A: Quantum Computing												
CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	3	2	2	1	3	1	3
CO2	3	3	1	-	-	2	2	2	1	3	-	3
CO3	3	3	2	2	1	2	2	2	1	2	1	3
CO4	3	3	3	1	1	3	3	3	2	2	1	3
Avg	**3**	**2.75**	**1.75**	**1.5**	**1**	**2.5**	**2.25**	**2.25**	**1.25**	**2.5**	**1**	**3**

Syllabus (PEC-CS701A)

Unit	Content	Hrs/Unit	Marks/ Unit
1	Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination Of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchyschwarez and triangle Inequalities.	3	
2	Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators	10	

3	Commutator Algebra, Heisenberg uncertainty principle, polar decomposition &singular values, Postulates of Quantum Mechanics.	5	
4	Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices. Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.	5	
5	Quantum Measurement Theory: Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized Measurements, Positive Operator- Valued Measures.	8	
6	Recent trends in Quantum Computing Research, Quantum Computing Applications of Genetic Programming.	6	

Books

Text book and Reference books:

1. Quantum Computing without Magic by Zdzislaw Meglicki
2. Quantum Computing Explained By DAVID Mc MAHON
3. Quantum Computer Science By Marco Lanzagorta, Jeffrey Uhlmann
4. An Introduction to Quantum Computing Phillip Kaye, Raymond Laflamme, Michele Mosca.

PEC-CS701B: Cloud Computing

Course Outcome (CO)

Student will be able to:

CO1	Identify the appropriate deployment models, service models and basic cloud architecture
CO2	Explain the concept of abstraction and different aspects of virtualization technology
CO3	Understand the importance of protocols and standards in management for cloud and Identify security implications in cloud computing
CO4	Analyze different services and applications in Cloud Computing

CO-PO Mapping

CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	1	2	-	-	-	2	-	3	2
CO2	1	2	-	-	3	-	-	-	2	2	-	2
CO3	2	1	2	1	3	-	-	-	2	2	1	2
CO4	2	1	2	1	2	-	-	-	2	-	2	2
Avg	2	1.5	2	1	2.5	-	-	-	2	2	2	2

Syllabus (PEC-CS701B)

Unit	Content	Hrs/ Unit	Marks /Unit
1	**Definition of Cloud Computing and its Basics (Lectures)**. Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Compensability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS).	9	
2	**Use of Platforms in Cloud Computing** Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance,Concepts of Platform as a Service,	12	

	Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks, Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service., Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service, Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services		
3	**Cloud Infrastructure**: Cloud Management:An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle).Concepts of Cloud Security: Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	7	
4	**Concepts of Services and Applications :** Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs, Applications in the Cloud: Concepts of cloud	8	

	transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services,Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services		

Books

Text book and Reference books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson
6. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

PEC-CS701D: Multi-agent Intelligent

Course Outcome (CO)

Student will be able to:

CO1	Define agent, Intelligent agent and Multi-Agent Systems
CO2	Explain the design of different intelligent agents.
CO3	Illustrate agents in expert system and distributed system

CO-PO Mapping

PEC-CS701D: Multi-agent Intelligent												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	3	3	2	-	-	-	2	1	2	1	3
CO2	3	3	2	3	1	-	-	2	1	2	-	3
CO3	3	3	3	2	1	-	-	2	1	2	1	3
Avg	**2.66**	**3**	**2.66**	**2.33**	**1**	**-**	**-**	**2**	**1**	**2**	**1**	**3**

Syllabus (PEC-CS701D)

Unit	Content	Hrs/ Unit	Marks /Unit
1	Introduction: what is an agent?:agents and objects; agents and expert systems; agents and distributed systems; typical application areas for agent systems.	3	
2	Intelligent Agents: the design of intelligent agents reasoning agents (eg AgentO), agents as reactive systems (eg subsumption architecture); hybrid agents (eg PRS); layered agents (eg Interrap) a contemporary (Java-based) framework for programming agents (eg the Jack language, the JAM! system).	9	
3	Multi-Agent Systems: Classifying multi-agent interactions - cooperative versus non-cooperative; zero-sum and other interactions; what is cooperation? how cooperation occurs - the Prisoner's dilemma and Axelrod's experiments; Interactions between self interested agents: auctions & voting systems: negotiation; Interactions between benevolent agents: cooperative distributed problem solving (CDPS), partial global planning; coherence and coordination; Interaction languages and protocols: speech acts, KQML/KIF, the FIPA framework.	12	
4	Advanced topics: One issue selected from the contemporary research literature, perhaps by guest lecturer.	9	

Books

Text book and Reference books:

1. An Introduction to Multi Agent Systems - Second Edition. Michael Wooldridge (Wiley, 2009)
2. Programming Multi-agent Systems in Agent Speak Using Jason. Rafael H. Bordini, Jomi Fred Hubner and Michael Wooldridge (Wiley, 2007)

PEC-CS701D: Machine Learning

Course Outcome (CO)

Student will be able to:

CO1	To learn the concept of how to learn patterns and concepts from data without being explicitly programmed
CO2	To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
CO3	Explore supervised and unsupervised learning paradigms of machine learning.
CO4	To explore Deep learning technique and various feature extraction strategies.

CO-PO Mapping

PEC-CS701D: Machine Learning												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	2	-	-	3	2	2	2	2	1	3
CO2	3	3	3	-	1	3	-	2	2	2	2	3
CO3	3	3	2	2	1	3	2	3	2	2	2	3
CO4	3	3	3	1	1	3	2	3	2	2	3	3
Avg	**3**	**2.75**	**2.5**	**1.5**	**1**	**3**	**2**	**2.5**	**2**	**2**	**2**	**3**

Syllabus (PEC-CS701D)

Unit	Content	Hrs/ Unit	Marks/ Unit
1	**Supervised Learning (Regression/Classification)** • Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes • Linear models: Linear Regression, Logistic Regression, Generalized Linear Models • Support Vector Machines, Nonlinearity and Kernel Methods • Beyond Binary Classification: Multi-class/Structured Outputs, Ranking	10	
2	**Unsupervised Learning** • Clustering: K-means/Kernel K-means • Dimensionality Reduction: PCA and kernel PCA • Matrix Factorization and Matrix Completion • Generative Models (mixture models and latent factor models)	7	
3	Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)	6	
4	Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning	9	
5	Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference	9	
6	Recent trends in various learning techniques of machine learning and classification methods	5	

Books

Text book and Reference books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007
4. Dr. Rajiv Chopra, Machine Learning, Khanna Publishing House, 2018

PEC-CS702A: Neural Networks and Deep Learning

Course Outcome (CO)

Student will be able to:

CO1	Understand the fundamentals of artificial neural networks and deep learning.
CO2	Explain the architecture of artificial neural networks and deep learning.
CO3	Analyse different neural networks and deep learning algorithms
CO4	Apply different neural networks and deep learning algorithms in various problem domain.

CO-PO Mapping

PEC-CS702A: Neural Networks and Deep Learning												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	3	3	1	3	1	1	2	2	1	3
CO2	3	3	3	3	1	3	1	1	2	2	2	3
CO3	3	3	3	3	1	3	1	1	2	2	2	3
CO4	3	3	3	3	1	3	1	1	2	2	3	3
Avg	**3**	**2.75**	3	**3**	**1**	**3**	**1**	**1**	**2**	**2**	**2**	**3**

Syllabus (PEC-CS702A)

Unit	Content	Hrs/ Unit	Marks /Unit
1	**Introduction:** Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.	3	
2	**Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network. cardinality, operations, and properties of fuzzy relations.	6	
3	Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.	6	
4	**Conditional Random Fields:** Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	9	
5	**Deep Learning:** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.	6	
6	**Deep Learning research:** Object recognition, sparse coding, computer vision, natural language	6	

Books

Text book and Reference books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
4. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
5. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
6. Dr. Rajiv Chopra, Deep Learning, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)

PEC- CS702B: Soft Computing

Course Outcome (CO)

Student will be able to:

CO1	Understand the basic concept of soft computing and hard computing and apply them in designing solution to engineering problem.
CO2	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications to solving engineering and other problems.
CO3	Apply fuzzy logic and reasoning to handle uncertainty and solving interdisciplinary engineering problems
CO4	Use genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5	To understand the concept and techniques of designing and implementing of soft computing methods in real world problem.

CO-PO Mapping

PEC- CS702B: Soft Computing												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	3	3	3	-	-	-	-	-	-	-	2
CO2	3	3	3	3	3	3	-	-	-	-	-	2
CO3	3	3	3	3	3	3	-	-	-	-	-	2
CO4	3	3	3	3	3	-	-	-	1	1	-	2
CO5	3	3	3	3	-	3	-	-	2	2	-	2
Avg	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**1.5**	**1.5**	**-**	**2**

Syllabus (PEC- CS702B)

Unit	Content	Hrs/ Unit	Marks/ Unit
1	Introduction: Introduction to soft computing, introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm	8	
2	Fuzzy sets and Fuzzy logic systems: Classical Sets and Fuzzy Sets and Fuzzy relations: Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions: Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy. Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System-Mamdani Fuzzy Models –Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting	10	

3	Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron. Learning Methods: Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Backpropagation and multi layer networks. Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks. Neuo-Fuzzy modelling:Applications of Neural Networks: Pattern Recognition and Classification	10	
4	Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition	10	
5	PSO: Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).	4	

Books

1.Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy logic and genetic Algorithms “,PHI
3. Principles of Soft Computing”, S.N. Sivanandam, S. Sumathi, John Wiley and Sons
4. Genetic Algorithms in Search, Optimization and Machine Learning”, David E. Goldberg, Addison Wesley, 1997.
5. Neural Networks, Fuzzy logic, and Genetic Algorithms”, S. Rajasekaran & G. A. V. Pai , PHI
6.Neural Network, S. Haykin, Pearson Education, 2ed, 2001.

PEC-CS702E: Cyber Security

Course Outcome (CO)

Student will be able to:

CO1	To develop an understanding of modern network architectures from a design and performance perspective.
CO2	To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
CO3	To provide an opportunity to do network programming
CO4	To provide a WLAN measurement idea.

CO-PO Mapping

PEC-CS702E: Cyber Security												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	2	-	-	-	-	3	1	-	2	-
CO2	3	3	2	-	1	-	-	2	1	2	-	-
CO3	3	-	2	-	2	-	3	-	1	3	-	2
CO4	2	3	2	-	2	-	2	-	1	-	3	3
Avg	2.75	2.67	2	-	1.67	-	2.5	2.5	1	2.5	2.5	2.5

Syllabus (Cyber Security)

Unit	Content	Hrs/ Unit	Marks /Unit
1	Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyberwarfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cybersecurity – Organizational Implications.	6	
2	Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.	7	
3	Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defence Strategies.	8	
4	Cyber Forensics and Auditing: Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO27001:2013	10	
5	Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace. at Network Layer-IPSec.	5	

Books

Text book and Reference Book:

1. Cyber security, Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Information Security and Cyber Laws, Pankaj Agarwal
3. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., Enterprise Cybersecurity -How to Build a Successful Cyberdefense Program Against Advanced Threats, A-press
4. Nina Godbole, SumitBelapure, Cyber Security, Willey
5. Hacking the Hacker, Roger Grimes, Wiley
6. Cyber Law by Bare Act, Govt Of india, It Act 2000.
7. Information Security & Cyber Laws, Gupta & Gupta, Khanna Publishing House, (AICTE Recommended Textbook- 2018)

OEC-CS701B: Multimedia Systems

Course Outcome (CO)

Student will be able to:

CO1	Identify the fundamental concept of multimedia and its components such as text, audio, image and video
CO2	Understand the details of audio and video formats and techniques
CO3	Explain architecture and synchronization, storage models and access techniques of multimedia
CO4	Analyze different application areas of multimedia and media editors

CO-PO Mapping

OEC-CS701B: Multimedia Systems												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	1	3	3	-	2	-	2	3	1	-	1	2
CO2	1	2	3	-	3	-	-	-	1	-	1	-
CO3	1	3	3	-	3	-	2	2	1	-	1	-
CO4	2	3	3	-	3	-	2	-	1	-	1	3
Avg	1.25	2.75	3	-	2.75	-	2	2.5	1	-	1	2.5

Syllabus (OEC-CS701B)

Unit	Content	Hrs/ Unit	Marks /Unit
1	**Introduction:** Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications	2	
2	**Text and Audio, Image and Video** Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.	14	
3	**Synchronization, Storage models and Access Techniques:** Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD	8	
4	Image and Video Database, Document Architecture and Content Management Image representation, segmentation, similarity-based retrieval, image retrieval by color, shape and texture; indexing- k- d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing, Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD),	17	

	Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications		
5	Multimedia Applications Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	5	

Books

Text book and Reference Book:
1. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communications & Applications, Pearson Ed.
2. Nalin K. Sharda, Multimedia Information System, PHI.
3. Fred Halsall, Multimedia Communications, Pearson Ed.
4. Koegel Buford, Multimedia Systems, Pearson Ed.
5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
6. Ralf Steinmetz and Klara Nahrstedt, Multimedia Fundamentals: Vol. 1-Media Coding and Content Processing, PHI.
7. J. Jeffcoate, Multimedia in Practice: Technology and Application, PHI.
8. V.K. Jain, Multimedia and Animation, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)

OEC-CS701C: Project Management and EntrepreneurshipThoughts

Course Outcome (CO)

Student will be able to:

CO1	Describe Entrepreneurship & the steps to establish an enterprise and explain project Identification, formulation & project evaluation.
CO2	Examine role of entrepreneur in economic development and compare and classify types of entrepreneurs
CO3	Evaluate the entrepreneurial support in India
CO4	Describe special institutions for entrepreneurial development and assistance in India

CO-PO Mapping

OEC-CS701C: Project Management and Entrepreneurship Thoughts												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	2	-	-	3	-	-	2	3	2	3	2
CO2	2	2	-	-	3	-	-	2	3	2	3	2
CO3	2	2	-	1	3	-	-	2	3	2	3	2
CO4	2	2	-	1	3	-	-	2	3	2	3	2
Avg	2	2	-	1	3	-	-	2	3	2	3	2

Syllabus (OEC-CS701C)

Unit	Content	Hrs/ Unit	Marks/ Unit
1	Introduction: Meaning and Concept of Entrepreneurship, Innovation and entrepreneurship, Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks	2	
2	Entrepreneurship – An Innovation: Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent v/s Convergent Thinking, Qualities of a prospective Entrepreneur	2	
3	Idea Incubation: Factors determining competitive advantage, Market segment, blue ocean strategy, Industry and Competitor Analysis (market structure, market size, growth potential), Demand-supply analysis	4	
4	4. Entrepreneurial Motivation: Design Thinking - Driven Innovation, TRIZ (Theory of Inventive Problem Solving), Achievement motivation theory of entrepreneurship – Theory of McClelland, Harvesting Strategies	2	
5	Information: Government incentives for entrepreneurship, Incubation, acceleration. Funding new ventures – bootstrapping, crowd sourcing, angel investors, Government of India's efforts at promoting entrepreneurship and innovation – SISI, KVIC, DGFT, SIDBI, Defense and Railways	4	
6	Closing the Window: Sustaining Competitiveness, Maintaining Competitive Advantage, the Changing Role of the Entrepreneur.	2	
7	Applications and Project Reports Preparation	4	
8	PROJECT MANAGEMENT: Definitions of Project and Project Management, Issues and Problems in Project Management, Project Life Cycle - Initiation / Conceptualization Phase, Planning Phase, Implementation / Execution Phase, Closure / Termination Phase	4	

9	9. Project Feasibility Studies – Pre-Feasibility and Feasibility Studies, Preparation of Detailed Project Report, Technical Appraisal, Economic/Commercial/Financial Appraisal including Capital Budgeting Process, Social Cost Benefit Analysis [2L]	2	
10	10. Project Planning – Importance of Project Planning, Steps of Project Planning, Project Scope, Work Breakdown Structure (WBS) and Organization Breakdown Structure (OBS), Phased Project Planning [2L]	2	
11	Project Scheduling and Costing – Gantt chart, CPM and PERT Analysis, Identification of the Critical Path and its Significance, Calculation of Floats and Slacks, Crashing, Time Cost Trade-off Analysis, Project Cost Reduction Methods. [6L]	6	
12	Project Monitoring and Control – Role of Project Manager, MIS in Project Monitoring, Project Audit [2L]	2	
13	Case Studies with Hands-on Training on MS-Project [4L]	4	

Books

Text book and Reference Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P.; Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

PROJ-CS781: Project II

Course Outcome (CO)

Student will be able to:

CO1	Students able to **define** and **understand** the concepts to address specific management needs at the individual, team, division and/or organizational level.
CO2	Students able to **formulate** and **apply** strategies allowing organizations to achieve desire goals.
CO3	Students able to develop critical-thinking and analytical decision-making capabilities to **analyze** complex business problems and to redirect them to desired project-based solutions.
CO4	Students able to **evaluate** and enhance their leadership effectiveness and team-building skills.
CO5	Students able to **create** effective teams for the processing of assigned projects effectively and efficiently.

CO-PO Mapping

PROJ-CS781: Project II												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	3	2	2	3	3	3	2	2	3	2	3
CO2	2	3	3	2	3	2	3	2	3	3	2	3
CO3	2	3	2	2	3	-	3	2	2	2	2	3
CO4	2	3	-	2	3	3	-	2	3	-	2	3
CO5	2	-	-	-	3	2	3	2	-	-	2	-
Avg	2	3	2.33	2	3	2.5	3	2	2.5	2.67	2	3

Syllabus (PROJ-CS781)

Unit	Content	Hrs/ Unit	Marks /Unit
1	The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:		
2	The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include: 1.In depth study of the topic assigned in the light of the Report prepared under EC P1; 2.Review and finalization of the Approach to the Problem relating to the assigned topic; 3.Preparing an Action Plan for conducting the investigation, including team work; 4.Detailed Analysis/Modelling/Simulation/ Design/ Problem Solving/Experiment as needed; 5.Final development of product/process, testing, results, conclusions and future directions; 6.Preparing a paper for Conference presentation/Publication in Journals, if possible; 7.Preparing a Dissertation in the standard format for being evaluated by the Department. 8.Final Seminar Presentation before a Departmental Committee.		

4th Yr/8th Semester

PEC- CS801A: Signal and Networks

Course Outcome (CO)

Student will be able to:

CO1	Analyze different types of signals
CO2	Understand basics electrical circuits with nodal, mesh analysis and electrical network theorems
CO3	Apply Laplace Transform for steady state and transient analysis.
CO4	Determine different network functions.
CO5	Appreciate the frequency domain techniques

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	1	-	-	1	1	-	-	-	1
CO2	2	3	1	-	1	-	-	-	1	1	1	1
CO3	2	3	1	-	-	1	1	-	1	1	1	1
CO4	2	3	1	-	-	1	1	-	1	1	1	1
CO5	2	3	1	-	-	1	1	-	1	1	1	1
AVG	2	2.6	1	1	1	1	1	1	1	1	1	1

Syllabus (PEC- CS801A)

Unit	Content	Hrs/Unit
1	Attacks on Computers & Computer Security - Introduction, Need for Security, Security approaches, Principles of Security, Types of attack	5
2	Cryptography: Concepts & Techniques- Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size	7
3	Symmetric Key Algorithm - Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.	8
4.	Asymmetric Key Algorithm, Digital Signature and RSA - Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).	5
5	Internet Security Protocols, User Authentication - Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.	6
6	Electronic Mail Security - Basics of mail security, Pretty Good Privacy, S/MIME.	4
7	Firewall - Introduction, Types of firewall, Firewall Configurations, DMZ Network	3

Books

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Cryptography and Network Security" by V.K. Jain, Khanna Publishing House,
3. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
4. Cryptography & Network Security: Atul Kahate, TMH.
5. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson.
6. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
7. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly .
8. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

PEC- CS801B: Cryptography and Network Security

Course Outcome (CO)

Student will be able to:

CO1	Familiarize with the elements of classical encryption techniques and block ciphers, such as data encryption standard.
CO2	Understand the asymmetric key encryption such as, public-key cryptography and key distribution such as Diffie-Hellman Key Exchange as well as User Authentication Protocols.
CO3	Analyze and evaluate the design of hash function and MAC algorithms, and digital signatures
CO4	Design and develop network security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS, HTTPS, SSH, etc .

CO-PO Mapping

Cryptography and Network Security (PEC CS 801B)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO1 0**	**PO 11**	**PO 12**
CO1	3	-	-	-	-	-	1	3	-	2	-	2
CO2	2	2	-	2	3	-	1	3	-	-	-	2
CO3	-	3	-	3	2	-	1	3	2	2	-	3
CO4	2	3	-	2	3	-	2	3	3	3	-	3
Avera ge	2.3 3	2.6 6	-	2.3 3	2. 66	-	1.2 5	3	2. 5	2.3 3	-	2.5

Syllabus (PEC- CS801B)

Unit	Content	Hrs/Unit
1	Attacks on Computers & Computer Security - Introduction, Need for Security, Security approaches, Principles of Security, Types of attack	5
2	Cryptography: Concepts & Techniques- Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size	7
3	Symmetric Key Algorithm - Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.	**8**
4.	Asymmetric Key Algorithm, Digital Signature and RSA - Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).	**5**
5	Internet Security Protocols, User Authentication - Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.	**6**
6	Electronic Mail Security - Basics of mail security, Pretty Good Privacy, S/MIME.	**4**
7	Firewall - Introduction, Types of firewall, Firewall Configurations, DMZ Network	**3**

Books

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Cryptography and Network Security" by V.K. Jain, Khanna Publishing House,
3. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
4. Cryptography & Network Security: Atul Kahate, TMH.
5. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson.
6. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
7. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly .
8. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

PEC CS801C: Speech and Natural Language Processing

Course Outcome (CO)

Student will be able to:

CO1	Understand the approaches to syntax and semantics in Natural Language Processing, the various types of language processors, the elements of formal language theory, the types of grammar, and the computational morphology.
CO2	Realize the basic parsing strategies for context-free grammars, the data structures and algorithms for parsing, and the approaches to ambiguity resolution, generation, and dialogue.
CO3	Explain and apply the fundamental algorithms and techniques in Natural Language Processing

CO-PO Mapping

Speech and Natural Language Processing (PEC CS801C)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	3	2				1	1				2
CO2	3	3	3	3	1		2			2	1	2
CO3	3	2	2	1	1	1	1					1
Avg	3	2.6	3	2	1	1	1.3	1		2	1	1.6

Syllabus (PEC CS801C)

Unit	Content	Hrs/ Unit
1	**Regular Expressions and Automata Recap) -** Introduction to NLP, Regular Expression, Finite State Automata [2L] **Tokenization -** Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance [5L] **Morphology -** Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer [4L]	11
2	**Language Modeling** Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models. [4L] **Hidden Markov Models and POS Tagging** Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging – Rule based and Machine Learning based approaches, Evaluation. [4L]	8
3	**Text Classification** Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources and Techniques. [4L] **Context Free Grammar** Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing [4L]	9

4.	Computational Lexical Semantics Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical Semantics – Thesaurus based and Distributional Word Similarity [4L] Information Retrieval Boolean Retrieval, Term-document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval – Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback [5L]	**9**

Books

1. Speech and Language Processing, Jurafsky and Martin, Pearson Education
2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press
3. Multilingual Natural Language Processing Applications from Theory to Practice: Bikel, Pearson.

PEC- CS801D: Web and Internet

Course Outcome (CO)

Student will be able to:

CO1	Web and Internet Technology
CO2	Create web pages using XHTML and Cascading Style Sheets.
CO3	Build dynamic web pages using JavaScript (Client-side programming).
CO4	Create XML documents and Schemas.
CO5	Build interactive web applications using AJAX.

CO-PO Mapping

Web and Internet Technology (PEC CS801D)												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	3		2		1	2	1		1	1
CO2		3	3		2		2		1			1
CO3		3	3		2		2		1			1
CO4	2		3	2		1	2	1		1		1
CO5	2		2	3	2	1	2		1	2	1	1
Average	2	3	2.8	2.5	2	1	1.8	1.5	1	1.5	1	1

Syllabus (PEC- CS801D)

Unit	Content	Hrs/ Unit
1	Introduction (1L): Overview, Network of Networks, Intranet, Extranet and Internet. World Wide Web (1L): Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. Review of TCP/IP (1L): Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing (1L): Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables. Internet Routing Protocol (1L): Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. Electronic Mail (1L): POP3, SMTP.	6
2	HTML (3L): Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue. Image Maps (1L): map, area, attributes of image area. Extensible Markup Language (XML) (4L): Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief. CGI Scripts (1L): Introduction, Environment Variable, GET and POST Methods.	9

3	PERL (3L): Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling. JavaScript (4L): Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies (1L): Definition of cookies, Create and Store a cookie with example. Java Applets (2L): Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications. Client-Server programming In Java (2L):	10
4.	Java Socket, Java RMI. Threats (1L): Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks. Network security techniques (2L): Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall (1L): Introduction, Packet filtering, Stateful, Application layer, Proxy.	4
5	Internet Telephony (1L): Introduction, VoIP. Multimedia Applications (2L): Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV. Search Engine and Web Crawler (2L): Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.	5

Books

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.(Chapters 5,6,12)

PEC- CS801E: Internet of Things

Course Outcome (CO)

Student will be able to:

CO1	Explain the definition and usage of the term "Internet of Things" in different contexts
CO2	Understand the key components that make up an IoT system
CO3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stac
CO4	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming, and data analysis
CO5	Understand where the IoT concept fits within the broader ICT industry and possible future trends
CO6	Appreciate the role of big data, cloud computing and data analytics in a typical IoT system

CO-PO Mapping

Internet of Things (PEC- CS801E)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	1	2	3	3	3	2	2	1	1			1
CO2		3	3	1			1	1		1		1
CO3		3	3	1			1	1		1		1
CO4	2	3	3	3	2		1		2	2	1	2

CO5	2	3			2	1	1		2	2	1	2
CO6	2	3			2	1	1		2	2		
Avg	1.75	2.83	3	2	2.25	1.33	1.16	1	1.75	1.6	1	1.75

Syllabus (PEC- CS801E)

LECTURE WITH BREAKUP	NO. OF LECTURES
Unit 1: Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT	7
Unit 2: Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc	8
Unit 3: Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modelling of Sensors Importance and Adoption of Smart Sensors	11
Unit 4: Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol-gel	10

Unit 5: Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor	7
Unit 6: Recent trends in smart sensor for day to day life, evolving sensors and their architecture.	5

Books

1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing
2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing
3. Jeeva Jose, Internet of Things, Khanna Publishing House.
4. Internet of Things, Arsheep Bahga and Vijay Madisetti

OEC- CS801A: Big Data Analysis

Course Outcome (CO)

Student will be able to:

CO1	Describe big data and use cases from selected business domains
CO2	Explain NoSQL big data management
CO3	Install, configure, and run Hadoop and HDFS
CO4	Perform map-reduce analytics using Hadoop
CO5	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

CO-PO Mapping

OEC- CS801A: Big Data Analysis												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	1					1			1
CO2	2	2	2	1					1			1
CO3	2			1								1
CO4	2			1								1

CO5	2	2	2	1	3				1			1
Avg	2	2	2	1	3				1			1

Syllabus (OEC- CS801A)

LECTURE WITH BREAKUP	NO. OF LECT.
Unit 1: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.	8
Unit 2: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	8
Unit 3: Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures	9

Unit 4: MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats	10
Unit 5: Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.	7
Unit 6: Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts.Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.	6

Books

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. V.K. Jain, Big Data and Hadoop, Khanna Publishing House, New Delhi (2017).
3. V.K. Jain, Data Analysis, Khanna Publishing House, New Delhi (2019).
4. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
5. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
6. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
7. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
8. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
9. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
10. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
11. Alan Gates, "Programming Pig", O'Reilley, 2011.

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OEC- CS801B: Cyber Law and Ethics

Course Outcome (CO)

Student will be able to:

CO1	Identify appropriate and ethical behaviors, legal standards, rights, restrictions, and moral duties when accessing technology systems, digital media, and information technology within the context of today's society.
CO2	Apply examples of modern compliance in relation to NIST and other applicable standards, laws, and regulations
CO3	Evaluate the relationship between ethics and law, describe civil disobedience and its relation to ethical hacking, describe criminal penalties related to unethical hacking, and apply the notion of "grey areas" to describe situations where law has not yet caught up to technological innovation.
CO4	Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

CO-PO Mapping

Cyber Law and Ethics (OEC CS801B)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	-	3	-	2	3	3	-	1	3	2
CO2	3	2	-	2	-	3	3	3	-	1	2	3
CO3	3	2	-	2	-	3	2	3	-	-	2	2

CO4	2	3	-	2	1	3	3	-	-	1	2	2
Average	2.75	2.25	-	2.25	1	2.75	2.75	3	-	1	2.25	2.25

Syllabus (OEC- CS801B)

Unit	Content	Hrs/Unit
1	**Introduction of Cybercrime:** What is cybercrime?, Forgery, Hacking, Software Piracy, Computer Network intrusion[4L]. **Category of Cybercrime:** how criminals plan attacks, passive attack, Active attacks, cyberstalking. [4L]	8
2	**Cybercrime Mobile & Wireless devices:** Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop [8L]	8
3	**Tools and Methods used in Cyber crime:** Proxy servers, panword checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: buffer over flow. [8L]	8
4.	**Phishing & Identity Theft:** Phising methods, ID Theft; Online identity method. [4L] **Cybercrime & Cybersecurity:** Legal aspects, indian laws, IT act, Public key certificate. [4L]	8

Books

1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Information Security & Cyber laws, Gupta & Gupta, Khanna Publishing House

OEC-CS801C: Mobile Computing

Course Outcome (CO)

Student will be able to:

CO1	Define mobile technologies in terms of hardware, software, and communications
CO2	Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.
CO3	Evaluate the effectiveness of different mobile computing frameworks.
CO4	Describe how mobile technology functions to enable other computing technologies.
CO5	Appreciate the frequency domain techniques

CO-PO Mapping

Mobile Computing (OEC CS 801C)

CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**P O4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	1	2		2								
CO3	3	2	3		3						3	
CO4	2	1	3	1			3		2		3	
CO5	2	2					2		2			
Avg	2	1.75	3	1.33	2.5	1	2	1	1.5	1	3	

Syllabus (PEC- CS801A)

Unit	Content	Hrs/ Unit	Marks/Unit
1	Introduction to Personal Communications Services(PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.	5	
2	General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.	5	

3	Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	7	
4.	Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G	7	
5	Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.	7	
6	Server-side programming in Java, Pervasive webapplication architecture, Device independent example application	8	

Books

1. "Pervasive Computing", Burkhardt, Pearson
2. "Mobile Communication", J. Schiller, Pearson
3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001
4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.
5. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
6. "Wireless Web Development", Ray Rischpater, Springer Publishing,
7. "The Wireless Application Protocol", Sandeep Singhal, Pearson .

8. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,
9. Brijesh Gupta "Mobile Computing", Khanna Publishing House, New Delhi

OEC-IT801D: Robotics

Course Outcome (CO)

Student will be able to:

CO1	Explain the fundamentals of robotics, sensors, instrumentation in robotics and its components
CO2	Illustrate the Kinematics and Dynamics of robotics
CO3	Elucidate the need and implementation of related Instrumentation & control in robotics
CO4	Describe the movement of robotic joints with computers/microcontrollers.

CO-PO Mapping

Robotics (OEC-IT801D)

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	1	2		2								
CO3	3	2	3		3						3	

CO4	2	1	3	1			3		2		3	
Avg	2	1.75	3	1.33	2.5	1	2	1	1.5	1	3	

Syllabus (OEC-IT801D)

Unit	Content	Hrs/ Unit
1	**Introduction:** Introduction—brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.	1
2	**Elements of robots–links, joints, actuators, and sensors** Position and orientation of a rigid body, Homogeneous transformations,Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.	5
3	Kinematics of serial robots Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tract rix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.	4

4.	Kinematics of parallel robots Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.	5
5.	Velocity and static analysis of robot manipulators Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.	**5**
6	Dynamics of serial and parallel manipulators Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics, Commercially available multi-body simulation software (ADAMS) and Computer algebra software Maple.	**4**
7	Motion planning and control Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.	**6**

8	Modeling and control of flexible robots Models of flexible links and joints, Kinematic modeling of multi-link flexible robots, Dynamics and control of flexible link manipulators, Numerical simulations results, Experiments with a planar two-link flexible manipulator.	**4**
9	Modeling and analysis of wheeled mobile robots 3Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain, Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.	**3**
10	Selected advanced topics in robotics Introduction to chaos, Non-linear dynamics and chaos in robot equations, Simulations of planar 2 DOF manipulators, Analytical criterion for unforced motion. Gough-Stewart platform and its singularities, use of near singularity for fine motion for sensing, design of Gough-Stewart platform based sensors. Over-constrained mechanisms and deployable structures, Algorithm to obtain redundant links and joints, Kinematics and statics of deployable structures with pantographs or scissor-like elements (SLE's).	**3**

Books

1. RoboticsProcess Automation, Khanna Publishing House
2. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, NewDelhi,2014
3. Ghosal,A., "Robotics", Oxford,New Delhi, 2006.

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OEC-CS801E: Soft Skill & Interpersonal

Course Outcome (CO)

Student will be able to:

CO1	Exhibit effective interpersonal communication in a variety of settings and de-escalatory behaviors in situations of conflict.
CO2	Demonstrate respect for others' viewpoints and acknowledgment and validation of the feelings, opinions, and contributions of others.
CO3	Apply active listening skills effectively and perceive the listener's interpersonal needs.
CO4	Establish and identify when using interpersonal communication and maintain proper eye contact while communicating interpersonally.
CO5	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
CO6	Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.

CO-PO Mapping

OEC-CS801E: Soft Skill & Interpersonal												
CO'S	**PO'S**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	1					1			1

CO2	2	2	2	1					1			1
CO3	2			1								1
CO4	2			1								1
CO5	2	2	2	1	3				1			1
CO6	2	2	1	1					1			1
Avg	2	2	2	1	3				1			1

Syllabus (OEC-CS801E)

Unit	Content	Hrs/ Unit
1	Introduction:ANewApproachToLearning,PlanningAndGoal-Setting,HumanPerceptions: Understanding People, Types Of Soft Skills: Self-Management Skills, Aiming For Excellence :Developing Potential And Self-Actualization, Need Achievement And Spiritual Intelligence	5
2	Conflict Resolution Skills: Seeking Win-Win Solution, Inter-Personal Conflicts: Two Examples, Inter-Personal Conflicts: Two Solutions, Types of Conflicts: Becoming A Conflict Resolution Expert Types Of Stress: Self-Awareness About Stress, Regulating Stress: Making The Best Out Of Stress	5
3	Habits: Guiding Principles, Habits: Identifying Good And Bad Habits, Habits: Habit Cycle ,Breaking Bad Habits, Using The Zeigarnik Effect For Productivity And Personal Growth, Forming Habits Of Success	5

4.	Communication: Significance Of Listening, Communication: Active Listening, Communication: Barriers To Active Listening, Telephone Communication: Basic Telephone Skills ,TelephoneCommunication:AdvancedTelephoneSkills,TelephoneCommunication:EssentialTelephoneSkills	5
5.	Technology And Communication: TechnologicalPersonality,TechnologyAndCommunication:MobilePersonality?,Topic:TechnologyAndCommunication:E- Mail Principles, Technology And Communication: How Not To Send E-Mails!, Technology And Communication: Netiquette, Technology And Communication: E-Mail Etiquette	5
6	CommunicationSkills: Effective Communication, Barriers To Communication: Arising Out Of Sender/Receiver's Personality, Barriers To Communication: Interpersonal Transactions, Barriers To Communication: Miscommunication, Non-Verbal Communication: Pre-Thinking Assessment-1, Non-Verbal Communication: Pre-Thinking Assessment-2	5
7	Nonverbal Communication: Introduction And Importance , Non-Verbal Communication: Issues And Types, Non-Verbal Communication: Basics And Universals, Non-Verbal Communication: Interpreting Non-Verbal Cues, Body Language: For Interviews, Body Language : For Group Discussions Presentation Skills: Overcoming Fear.	5
8	Presentation Skills: Becoming A Professional, Presentation Skills: The Role Of Body Language, Presentation Skills: Using Visuals, :Reading Skills: Effective Reading, Human Relations: Developing Trust And Integrity	5

Books

1. Dorch, Patricia. *What Are Soft Skills*? New York: Execu Dress Publisher,2013.
2. Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company,2013.
3. Klaus, Peggy, Jane Rohman &Molly Hamaker. The Hard Truth about Soft Skills .London: Harper Collins E-books, 2007.
4. Petes S.J., Francis. Soft Skills and Professional Communication. NewDelhi: TataMcGraw-HillEducation,2011.
5. Stein, Steven J.& Howard E.Book. The EQEdge: Emotional Intelligence and Your Success. Canada: Wiley& Sons,2006.

OEC-CS802A: E-Commerce & ERP

Course Outcome (CO)

Student will be able to:

CO1	Illustrate the impact of E-commerce on business models and strategy.
CO2	Understand the major types of E-commerce and how procurement and supply chains relate to B2B E-commerce.
CO3	Demonstrate the process that should be followed in building an E-commerce presence.
CO4	Summarize the key security threats in the E-commerce environment

CO-PO Mapping

E-Commerce and ERP (OEC-CS802A)												
CO'S	PO'S											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	2	-	2	2	-	-	2
CO2	2	2	-	2	-	2	-	3	2	-	3	3
CO3	2	3	-	2	-	1	-	2	2	-	2	3
CO4	2	2	-	1	-	3	-	3	-	-	2	2
Avg	2.25	2.25	-	1.66	-	2	-	2.5	2	-	2.33	2.5

Syllabus (OEC-CS802A)

1. Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations For Controlling E – Commerce, Cyber Laws. [3 L]
2. Technologies : Relationship Between E – Commerce & Networking, Different Types of Networking Commerce, Internet, Intranet & Extranet, EDI Systems Wireless Application Protocol : Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce . [5 L]
3. Business Models of e – commerce : Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance. [2 L]

4. E – strategy : Overview, Strategic Methods for developing E – commerce. [2 L]
5. Four C's : (Convergence, Collaborative Computing, Content Management & Call Center). Convergence : Technological Advances in Convergence – Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing : Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security. Content Management : Definition of content, Authoring Tools & Content Management, Content – partnership, repositories, convergence, providers, Web Traffic & Traffic Management ; Content Marketing. Call Center : Definition, Need, Tasks Handled, Mode of Operation, Equipment , Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).[6 L]
6. Supply Chain Management : E – logistics, Supply Chain Portal, Supply Chain Planning Tools(SCP Tools), Supply Chain Execution (SCE), SCE - Framework, Internet's effect on Supply Chain Power. [3 L]
7. E – Payment Mechanism : Payment through card system, E – Cheque, E – Cash, E – PaymentThreats & Protections. [1 L]
8. E – Marketing :. Home –shopping, E-Marketing, Tele-marketing [1 L]
9. Electronic Data Interchange (EDI) : Meaning, Benefits, Concepts, Application, EDI Model,Protocols (UN EDI FACT / GTDI, ANSI X – 12), Data Encryption (DES / RSA). [2 L]
10. Risk of E – Commerce : Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digitalsignatures. [4 L]
11. Enterprise Resource Planning (ERP) : Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign, Knowledge engineering and data warehouse . Business Modules: Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales & Distribution ERP Package, ERP Market: ERP Market Place, SAP AG, PeopleSoft, BAAN, JD Edwards, Oracle Corporation ERP-Present and Future: EnterpriseApplication Integration (EAI), ERP and E-Commerce, ERP and Internet, Future Directions in ERP [10]

Books

1. E-Commerce,M.M. Oka, EPH
2. Kalakotia, Whinston : Frontiers of Electronic Commerce , Pearson Education.
3. Bhaskar Bharat : Electronic Commerce - Technologies & Applications.TMH
4. Loshin Pete, Murphy P.A. : Electronic Commerce , Jaico Publishing Housing.
5. Murthy : E – Commerce , Himalaya Publishing.
6. E – Commerce : Strategy Technologies & Applications, Tata McGraw Hill.
7. Global E-Commerce, J. Christopher & T.H.K. Clerk, University Press
8. Beginning E-Commerce, Reynolds, SPD
9. Krishnamurthy, E-Commerce Mgmt, Vikas

OEC-CS802B: Micro-electronics and VLSI

Course Outcome (CO)

Student will be able to:

CO1	Able to describe fabrication steps of IC and construct stick diagram & layout of Logic Gates
CO2	Build upon the theoretical, mathematical, and physical analysis of digital VLSI circuits, for proper understanding of concept, working, analysis and design.
CO3	Design, simulate and analyze any electronic device and circuit.
CO4	Apply the concepts in testing which can help them design a better yield in IC design and tackle the problems associated with testing of integrated circuits at earlier design levels to significantly reduce the testing costs.
CO5	Develop the ability to analyze and design electrical interconnect using equivalent circuit models.

CO-PO Mapping

Micro-electronics and VLSI(OEC-CS802B)												
CO'S	**PO'S**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	1	2		2								
CO3	3	2	3		3						3	
CO4	2	1	3	1			3		2		3	

CO5	2	2					2		2			
Avg	2	1.75	3	1.33	2.5	1	2	1	1.5	1	3	

Syllabus (OEC-CS802B)

Introduction to CMOS circuits: MOS Transistors, MOS transistor switches, CMOS Logic, The inverter, Combinational Logic, NAND gate, NOT Gate, Compound Gates, Multiplexers, Memory-Latches and Registers. [6L]

Processing Technology: Silicon Semiconductor Technology- An Overview, wafer processing, oxidation, epitaxy deposition, Ion-implantation and diffusion, The Silicon Gate Process- Basic CMOS Technology, basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator, CMOS process enhancement-Interconnect, circuit elements, 3-D CMOS. Layout Design Rule: Layer Representations, CMOS n-well Rules, Design Rule of background scribe line, Layer Assignment, SOI Rule[10L].

Power Dissipation: Static dissipation, Dynamic dissipation, short-circuit dissipation, total power dissipation. Programmable Logic, Programmable Logic structure, Programmable interconnect, and Re programmable Gate **Array:** Xilinx Programmable Gate Array, Design Methods: Behavioral Synthesis, RTL synthesis[8L]

Placement: placement: Min cut based placement – Iterative improvement placement simulated annealing. Routing: Segmented channel routing– maze routing–rout ability and routing resources– net delays. [5L]

VerificationandTesting: VerificationVersusTesting,Verification:logicsimulationdesignvalidation – timing verification – Testing concepts: failures – mechanisms and faults – fault coverage – ATPG methods – types of tests – FPGAs – programmability failures – design forte stability.[5L]

Overview of VHDL[5L]

Books

1. “DigitalIntegratedCircuit”,J.M.Rabaey,Chandrasan,Nicolic,Pearson
2. “CMOS Digital Integrated circuit”, S.M.Kang & .Leblebici, MH
3. 3.”ModernVLSIDesign” WayneWolf, Pearson
4. “Algorithm for VLSI Design & Automation”, N.Sherwani, Kluwer5.”VHDL”, Bhaskar,PHI

OEC- CS802C: Economic Policies in India

Course Outcome (CO)

Student will be able to:

CO1	Understand the framework in which the functioning of the economy and economics policies operates.
CO2	Apply the knowledge of economics to solve complex economic problems of the country
CO3	Undertake research on various social and economic issues and come out with solutions to perennial problems in this sphere.
CO4	Develop macroeconomic models, which can serve as the workhorse for a fast-growing economy
CO5	Using various econometric and time series techniques evaluate the policies implemented by the government.

CO-PO Mapping

Economic Policies in India (OEC- CS802C)												
CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	1	2		2								
CO3	3	2	3		3						3	
CO4	2	1	3	1			3		2		3	

CO5	2	2					2		2			
Avg	2	1.75	3	1.33	2.5	1	2	1	1.5	1	3	

Syllabus (OEC- CS802C)

Economic Development and its Determinants
Approaches to economic development and its measurement – sustainable development; Role of State, market and other
institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.
Planning in India
Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for
development – Panchayats, NGOs and pressure groups.
Demographic Features, Poverty and Inequality
Broad demographic features of Indian population; rural-urban migration; Urbanization and civic amenities; Poverty and
Inequality.
Resource Base and Infrastructure
Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing
infrastructure development.
The Agricultural Sector
Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output;
industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture
and in food security – policies for sustainable agriculture.
Section – II
Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India;
Privatization and
disinvestment debate; Growth and pattern of industrialization; Small-scale sector; Productivity in industrial sector; Exit

policy – issues in labour market reforms; approaches for employment generation.

Public Finances

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India.

Money, Banking and Prices

Analysis of price behaviour in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India.

External Sector

Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate policy; Foreign capital and MNCs in India; The progress of trade reforms in India.

Economic Reforms

Rationale of internal and external reforms; Globalization of Indian economy; WTO and its impact on the different sectors of the economy; Need for and issues in good governance; Issues in competition and safety nets in Indian economy.

Books

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development(Essays in honour of Manmohan Singh), Oxford University Press, NewDelhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, GuruNanak Dev University Press, Amritsar.
4. Brahmananda, P. R. and V. R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy: Inter-State Perspectives, Bookwell, Delhi.

5. Chakravarty, S. (1987), Development Planning : The Indian Experience, Oxford University Press, NewDelhi.
6. Dantwala, M. L. (1996), Dilemmas of Growth : The Indian Experience, Sage Publications, NewDelhi.
7. Datt, R. (Ed.) (2001), Second Generation Economic Reforms in India, Deep & Deep Publications, NewDelhi.
8. Government of India, Economic Survey(Annual),Ministry of Finance, NewDelhi.
9. Jain, a.K. (1986), Economic Planning in India, Ashish Publishing House, NewDelhi.
10. Jalan,B. (1992),The Indian Economy–Problems and Prospects, Viking, New Delhi.

PROJ- CS881: Project-III

Course Outcome (CO)

Student will be able to:

CO1	Students able to **define** and **understand** the concepts to address specific management needs at the individual, team, division and/or organizational level.
CO2	Students able to **formulate** and **apply** strategies allowing organizations to achieve desire goals.
CO3	Students able to develop critical-thinking and analytical decision-making capabilities to **analyze** complex business problems and to redirect them to desired project-based solutions.
CO4	Students able to **evaluate** and enhance their leadership effectiveness and team-building skills.
CO5	Students able to **create** effective teams for the processing of assigned projects effectively and efficiently.

CO-PO Mapping

Project Management (PROJ CS881)

CO'S	PO'S											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	_	3	_	_	_	3	2	3	_
CO 2	2	_	2	3	_	_	_	_	_	2	3	_

CO 3	_	2	2	3	_	3	2	_	_	_	3	_
CO 4	2	2	_	_	3	1	_	_	3	_	3	2
CO 5	_	_	_	_	3	_	_	2	3	2	3	2
Avg	2	2	2.33	3	3	2	2	2	3	2	3	2

Code of Conducts of the Students

1. PREPARATION

All students must understand that it is their responsibility to follow this Code of Ethics and Conduct (hence referred to as the 'Code') and the rights, obligations, and limitations that it entails.

That the Institute's goal in implementing this Code is to pioneer and administer an equitable, conscientious, effective, and timely student discipline procedure, as well as to provide a system that encourages student progress through individual and communal accountability.

All students are expected to be well-versed in this Code, which may also be found on the Institute's official website.

2. JURISDICTION

2.1 The Institute shall have jurisdiction over the conduct of students associated/enrolled with the Institute, and shall be aware of all acts of misconduct, including incidents of ragging or otherwise, that occur on the Institute campus or in connection with Institute-related activities and functions.

2.2 The Institute may have jurisdiction over conduct that occurs off-campus that violates the ideal student conduct and discipline as outlined in this Policy and other regulations, as if the conduct occurred on campus, which shall include:

a) Any violations of the Sexual Harassment Policy of the Institute against other students of the Institute.

b) Physical assault, threats of violence, or conduct that threatens the health or safety of any person including other students at the Institute.

c) Possession or use of weapons, explosives, or destructive devices off campus.

d) Manufacturing, selling, or distributing illegal narcotics, alcohol, or other substances.

e) Conduct that has a negative impact on members of the off-campus community or is a nuisance to them.

The Institute shall consider the seriousness of the alleged offence, the risk of harm involved, whether the victim(s) are members of the campus community, and/or whether the off-campus conduct is part of a series of actions that occurred both on and off-campus when deciding whether to exercise such off-campus jurisdiction in the situations enumerated herein.

3. BEHAVIOR AND ETHICS

3.1 This Code applies to all types of student conduct on Institute grounds, including Institute-sponsored activities, functions hosted by other recognized student organizations, and any off-campus conduct that has or may have serious consequences or a negative impact on the Institute's interests or reputation.

3.2 Each student must sign a declaration recognizing this Code and promising to follow it at the time of admission:

a) He/she must be regular and complete his/her studies at the Institute.

b) If a student is obliged to abandon studies for any justifiable reason, he/she may be removed from the Institute with the Principal's written agreement.

c) As a result of such relief, the student will be required to pay any outstanding hostel/mess dues, and if the student was admitted on a scholarship, the grant will be cancelled.

3.3. The Institute believes that implementing behavioral norms would help to create a safe and efficient environment. All students must maintain academic integrity, respect all individuals and their rights and property, and ensure the safety of others, among other things.

3.4 All students shall refrain from engaging in all forms of wrongdoing, including engaging in any off-campus activities that could jeopardize the Institute's interests and reputation.

3.5 Discrimination (physical or verbal) based on a person's gender, caste, race, religion, or religious beliefs, color, region, language, disability, or sexual orientation, marriage, or family status, physical or mental disability, gender identity, or other factors.

3.6 Deliberately causing damage to Institute property or the property of other students and/or faculty members.

3.7 Any disruptive behavior in a classroom or at an Institute-sponsored event.

3.8 Inability to produce the Institute's identity card or refusal to produce it when asked by campus security officers.

3.9 Participating in activities without the Institute's consent, such as:

3.9.1 Organizing gatherings and processions.

3.9.2 Accepting membership in religious or terrorist organizations that the Institute/Government of India has outlawed.

3.9.3 Contrary to law or policy, illegal possession, carrying, or use of any weapon, ammunition, explosives, or potential weapons, fireworks.

3.9.4 Illegal possession or use of hazardous chemicals and controlled substances.

3.9.5 Smoking on the Institute's premises.

3.9.6 Possessing, consuming, distributing, selling, and/or tossing empty bottles on the Institute's campus are all prohibited.

3.9.7 Parking a vehicle in an area designated for parking other types of vehicles or in a no parking zone.

3.9.8 Improper driving on campus that may cause others to be inconvenienced.

3.9.9 Not informing the Chief Medical Officer about a pre-existing health problem, whether physical or psychological, that could impede academic development.

3.9.10 Unauthorized access to others' resources or theft.

3.9.11 Misconduct during student body elections or any Institute-sponsored activity.

3.9.12 Behaving in a disorderly, lewd, or indecent manner at the Institute, including, but not limited to, making excessive noise, pushing, and shoving, inciting or participating in a riot, or causing a group disruption.

3.10 Students are not permitted to communicate with media representatives on behalf of the Institute or to invite media persons to the campus without the authorization of the Institute management.

3.11 Without prior authorization, students are not permitted to capture audio or video lectures in classes or the behaviors of other students, instructors, or staff.

3.12 Students are not permitted to supply media with audio or video clips of any campus activity without prior approval.

3.13 Students are required to use social media properly and with caution.They are prohibited from making negative comments about other Institute employees on social media or engaging in any other activity that could harm the Institute's reputation.

3.14 Unauthorized entry, use, tampering, etc. of Institute property or facilities, private residences of staff/professors, offices, classrooms, computers networks, and other restricted facilities, as well as interference with others' work, is punishable.

3.15 Any damage to or destruction of Institute property or the property of others on Institute grounds.

3.16 Without the person's knowledge and explicit agreement, making a video/audio recording, taking pictures, or streaming audio/video of any person in a location where the person has a reasonable expectation of privacy.

3.17 Harassment, which is defined as harsh and objective behavior motivated by a person's race, color, national or ethnic origin, citizenship, sex, religion, age, sexual orientation, gender, gender identity, marital status, ancestry, physical or mental disability, or medical condition.

4 If there is a case against a student for a probable breach of code of conduct, then a committee will be constituted to recommend a suitable disciplinary action who shall enquire into the alleged violation and consequently indicate the action to be taken against the said student.

The committee may meet with the student to determine the extent of the misbehavior and recommend one or more of the disciplinary actions listed below, depending on the severity of the misconduct.

4.1 WARNING- Indicating that the delinquent student's actions were in breach of the Code, and that any future acts of misbehaviour will result in serious disciplinary punishment.

4.2 RESTRICTIONS - Reprimanding and restricting access to certain campus facilities for a period.

4.3 COMMUNITY SERVICE - For a set amount of time, which may be extended if necessary. Any future wrongdoing, as well as failure to comply with any imposed limitations, may result in severe disciplinary action, such as suspension or expulsion.

4.4 EXPULSION - Permanent expulsion of a student from the Institute, indicating that attending the Institute or participating in any student-related activities or living on campus is prohibited.

4.5 FINANCIAL PENALTY- This could include the suspension or forfeiture of a scholarship or fellowship for a set period.

4.6 SUSPENSION- A student may be suspended for a length of time, preventing them from engaging in student-related activities, classes, or programmes. Furthermore, unless permission is acquired from the Competent Authority, the student will be prohibited from using various Institute facilities. Suspension may be followed by dismissal, as well as the other punishments listed below.

4.7 For a period of three years, you will be ineligible to reapply for admission to the Institute, and

4.8 Withholding the grade card or certificate for the courses studied or work \scarred out.

5 APPEALS:

If a delinquent student feels he or she has been wronged by the application of any of the above punishments, he or she may file an appeal with the Principal. The Principal may decide on one of the following:

5.1 Accept the committee's proposal and impose the punishment recommended by the Committee or amend and impose any of the punishments stated in this Code that are appropriate with the degree of the proven wrongdoing. Or

5.2 Recommend the case to the committee for further consideration.

In all circumstances where there is a potential for student misconduct, the Director's decision is final and binding.

6 ACADEMIC INTEGRITY

The Institute values academic integrity and is devoted to building an intellectual and ethical environment based on academic integrity principles as a top institution for advanced scientific and technology research and education.

Academic integrity includes honesty, accountability, and awareness of ethical standards for study and scholarship. The Institute believes that the ideas and contributions of others should be appropriately acknowledged in all academic work. Academic integrity is critical to the Institute's and its research missions' success, and so academic integrity infractions are a significant offence.

6.1 Purpose and Scope

A. The academic integrity policy, which is an integral aspect of the Code, applies to all students at the Institute, and they are obligated to follow it.

The Policy serves a dual purpose:

- To make the ideals of academic honesty clearer, and
- To give examples of dishonest behavior and academic integrity infractions.

NOTE: These examples are intended to be illuminating rather than exhaustive.

B. Failure to follow these academic integrity principles jeopardizes the Institute's reputation as well as the worth of the degrees issued to its students.

As a result, every member of the Institute community takes responsibility for upholding the highest standards of academic integrity.

C. Academic integrity dictates that a student appropriately acknowledges and references the use of others' ideas, results, materials, or language.

Ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration; properly acknowledges all contributors to a given piece of work; and ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration.

Obtains all data or results ethically and accurately reports them, with no results suppressed that contradict his or her interpretation or conclusions.

Demonstrates ethical behavior toward all other students, respecting their integrity and right to pursue their educational goals without hindrance. This means that a student must not assist others in academic dishonesty or hamper their own academic advancement.

6.2 Examples of policy violations include, but are not limited to:

(i)Plagiarism Violation:

Plagiarism is defined as the use of someone else's content, ideas, figures, code, or data without properly recognizing the original source. This could include submitting material written by another person or previously published by oneself, directly or paraphrased.

Plagiarism can be defined as:

(a) reproducing text/sentences from a report, book, thesis, publication, or the internet in whole or in part.

(b) Reproducing previously published data, illustrations, figures, or images, whether one's own or someone else's.

(c) Incorporating non-textual material from other sources into one's class reports, presentations, manuscripts, research papers, or thesis without proper attribution, such as graphs, drawings, photographs, diagrams, tables, spreadsheets, computer programmes, or other non-textual material from other sources.

(d) Self plagiarism which comprises copying verbatim from one's own earlier \spublished work in a journal or conference proceedings without necessary citations.

e) Completing a course requirement by submitting a purchased or downloaded term paper or other resources.

f) Without citation, paraphrasing or modifying an author's words or style.

(ii) Cheating:

Cheating can take many forms, including, but not limited to:

(a) Exam copying, as well as copying of homework assignments, term papers, theses, or manuscripts.

(b) Permitting or enabling copying, making a report, or taking an examination on behalf of another person.

(c) Using unlawful materials, copying, collaborating without permission, and purchasing or borrowing papers or materials from a variety of sources.

(d) fabricating (falsifying) data and reporting it in theses and publications.

(e)Inventing new sources or citations when none exist

(f) Making changes to previously evaluated work and submitting it for re-evaluation

(g) Signing an assignment, report, research paper, thesis, or attendance sheet in the name of another student.

(iii) Conflict of Interest:

In a variety of activities such as teaching, research, publication, serving on committees, research funding, and consultancy, a clash of personal or private interests with professional actions can lead to a potential conflict of interest. Actual professional independence, integrity, and commitment must be protected, as well as the appearance of any impropriety resulting from conflicts of interest.

Conflict of interest is not restricted to personal financial gain; it extends to a vast range of professional academic activities including peer reviewing, serving on numerous committees, which may, for example, monitor financing or grant recognition, as well as influencing public policy.

Potential conflicts of interest must be notified in writing to competent authorities for a thoughtful decision to be made on a case-by-case basis, to promote transparency and boost credibility. In the part below dealing with resources, there is also some more information.

4.3 Academic behavior guidelines are presented here to protect against both negligence and purposeful dishonesty:

(a) For experiments and computational tasks, use suitable procedures. Data should be accurately described and compiled.

b) Save primary and secondary data such as original photographs, equipment data readouts, laboratory notebooks, and computer folders with care. Digital alteration of images/photos should be kept to a minimum; the original version should be maintained for subsequent inspection if necessary, and the changes done should be clearly indicated.

c) Ensure that experiments and simulations are robustly reproducible and statistically analyzed. It's critical to be honest about the facts and avoid "cherry picking" (omitting some data pieces to produce an outstanding statistic).

d) Laboratory notes should be kept in bound notebooks with printed page numbers so that they can be checked later for publication or patenting purposes. Each page should have a date on it.

e) Use your own language to write clearly. It is vital to resist the temptation to “copy and paste” from the Internet or other sources for class tasks, manuscripts, and thesis.

f) Cite prior reports, methodologies, computer programmes, and other sources appropriately. It's also a good idea to cite material from your own published work; otherwise, it'll be regarded self-plagiarism.

6.3. Individual and Collective Responsibilities: Responsibilities differ depending on the role played.

a) Student responsibilities:

Before submitting a thesis to the department (B.Tech, M Tech), the student is responsible for reviewing the thesis for plagiarism using proper tools. Furthermore, the student must guarantee that he or she is aware of the Institute's academic norms, that the paper has been examined for plagiarism, and that the thesis is original work. Plagiarism cannot always be detected with a web search. If a student notices or learns of any violations of the academic integrity policy, he or she should report the wrongdoing as soon as possible.

b) Faculty responsibilities:

Faculty members should guarantee that suitable methods for experiments, computations, and theoretical developments are followed, and that data is properly recorded and stored for future reference. They should also thoroughly analyze manuscripts and theses. Faculty members must also ensure personal compliance with the broad principles of academic integrity. Faculty members are expected to inform students in their respective courses about the Institute's academic integrity policy, to ensure minimum academic dishonesty, and to respond appropriately and promptly to academic integrity violations.

c) Institutional responsibilities:

A breach of academic integrity is a serious offence that can result in a variety of sanctions for both the individual and the institute. In the event of a student, the first academic infringement will result in a warning and/or a "F" mark in the course. If a repeat offence is deemed serious enough, it may result in expulsion. Faculty should bring any academic infractions to the attention of the department chairperson. When the Director receives reports of scientific misconduct, he or she may create a committee to review the situation and make recommendations for appropriate action on a case-by-case basis.