III & IV Semester scheme & Syllabus (2020-21) Department of Information Science and Engineering

DRAFT SCHEME AND SYLLABUS

Department of Information Science and Engineering

GLOBAL ACADEMY OF TECHNOLOGY
(Autonomous institution affiliated to VTU, Belagavi.
Accredited by NAAC with 'A' grade,
NBA Accredited CS, E&C, E&E, MECH and IS branches)
Ideal Homes Township,
Raja Rajeshwari Nagar. Bengaluru-560098.

PREAMBLE

There has been a lot of discussion on the current mode of engineering education in our country and its impact on employability of fresh engineering graduates. Employability rating of fresh graduates is far from being satisfactory and industries are running short of trained and skilled manpower.

The demands of the society are dynamic, complex and keep changing at a rapid pace. Technological advancement is providing several innovations and breakthroughs exponentially in IT related domains like Artificial intelligence, Internet of Things, Machine learning, Automation and Robotics. These interventions are changing further the expectations of the society on products and services. In view of this, it becomes imperative to equip students to learn the art of linking science and engineering to the needs of the industry and society. The students must relate their learning to provide solutions to complex and real-life problems faced by the society. Engineering education needs to focus on how to apply knowledge to complex, unstructured problems in a global platform. The herculean task ahead of the engineering institutions is to produce graduates who are employable. Employability does not mean that a student should be placed in an industry before he/she leaves the portals of an institution. Employability means equipping engineering graduates with necessary technical skills, communication skills, leadership qualities, soft skills, professional ethics, and a social responsibility.

The onus of providing graduates with the attributes mentioned above lies with the institutions. Institutes should create conducive atmosphere where students learn to stimulate their creativity and develop their talents. The graduates must be trained to work in teams and must be exposed to interdisciplinary areas to establish better links with present generation industries. The domain boundaries have collapsed and most of the engineering streams are getting integrated and blended. It is therefore crucial that the graduates must be made to understand the nuances of the engineering education and the importance of creative thinking, innovation and being sensitive to societal changes.

Global Academy of Technology (GAT) has understood the importance of broad-based education and has created a conductive environment for the students to blossom into complete individuals. A true broad-based education prepares students for life, without losing their areas of specialization and competence. Our aim is to become a premier institution imparting quality education in engineering and management to meet the changing needs of the industry and society. The entire team at GAT is committed to realize the dream of making GAT an institution of eminence and creating an indelible impression in the area of engineering education.

The present focus of the institute is to improve the laboratory infrastructure by bringing new industry relevant technology to enable higher level of learning in students, foster integrated learning by providing multiple industry relevant interfaces, enable students to take up industry relevant projects and encourage faculty to take up research by providing ability to add customer logic.
With changing times and emergence of disruptive technologies, GAT stands strong in adapting and encompassing these into the mainstream in shaping students' career, thus contributing directly to society and nation building.

Contents

1. Global Academy of Technology – An Overview

(Autonomous Institution under Visvesvaraya Technological University, Belagavi)

1.1 Vision of the Institute:

Become a premier institution imparting quality education in engineering and management to meet the changing needs of society.

1.2 Mission of the Institute:

- **Create environment conducive for continuous learning through quality teaching and learning processes supported by modern infrastructure.**
- **Promote Research and Innovation through collaboration with industries.**
- **Inculcate ethical values and environmental consciousness through holistic education programs.**

1.3 Objectives:

With a very firm resolve, Global Academy of Technology is continuously investing untiring efforts to enable students to:

- Develop careers in Government and Private engineering organizations and other professionally related domains.
- Pursue higher studies and research to develop innovative solutions and technologies in engineering and other multi-disciplinary areas.
- Improve professional and personal traits oriented towards professional ethics and environmental compulsions.
- Inculcate professional leadership and successful entrepreneurship qualities.
- Help society in raising the quality of life.

1.4 Quality Policies:

1. Providing Excellent Education Through High Quality, Experienced and Committed Faculty.
2. Evolving creative processes for optimal Knowledge and Skill Transfer.
3. Building up state-of-the-art infrastructure at par with international standards.
4. Creating an environment for holistic personality development and develop research temperament.

1.5 HALLMARKS OF GLOBAL ACADEMY OF TECHNOLOGY:

- Proactive management determined to build the institute as a Centre of Excellence in engineering education.
- Qualified and dedicated faculty in all the departments.
- State of the art Infrastructure and up to date laboratory and Library facilities.
- Lush green campus with an environment of tranquillity and harmony.

- ❖ Student centric teaching-learning processes banking on Outcome Based Education; students' friendly learning atmosphere.
- ❖ Emphasis on Project based learning throughout the course.
- ❖ Strong Industry-Institute interface with more than twenty Memorandum of Understanding (MOUs) signed with leading industries and institutions of repute.
- ❖ Indian Institute of Information Technology (IIIT), Allahabad, has signed a MOU for providing internships to students of GAT, research assistance to faculty, and conducting Faculty Development Programs in key areas of IT - Big Data, Cloud Computing, Artificial Intelligence, and Machine Learning.
- ❖ Mahatma Gandhi University, Kottayam, has signed a MOU to facilitate research in Nano Technology and provide research assistance to faculty of GAT.
- ❖ Industrial consultancy undertaken in many departments.
- ❖ Excellent Placement with more than 80% of the eligible students placed in leading IT companies, core industries and Start-up companies.
- ❖ Holistic and integrated training modules covering communication skills, leadership skills, soft skills and technical skills through professional trainers.
- ❖ On campus and off campus internship facilities.
- ❖ Robust parent connects and Student counselling system.
- ❖ In-house technical skill training programs/add on courses to enhance the employability of the students.
- ❖ Strong and growing alumni connect in place
- ❖ Exclusive Research and Development, Industry–Institute Interaction Cell and Teaching and Learning Centre in place.
- ❖ Rainwater harvesting facility in the campus.

The following academic processes are implemented on a regular basis to sustain a meaningful and proactive teaching-learning environment:

- Emphasis on **continuous revision of the curriculum,** based on feedback from the students and input from industry, alumni, and other stakeholders.
- Conduction of regular **training programme** for faculty, technical &supporting staff.
- Conduction of Academic Audit of each department on an annual basis.
- Under **open electives** students have the options to study subjects offered by other departments to augment their interdisciplinary knowledge.
- Students have to do **value added courses**, mandatory courses, certificate courses, and become members of professional bodies, etc.
- Advanced and enrichment courses are offered as Electives during the final year UG and PG Degree Programmes.
- **Self-Learning** is encouraged in students through MOOCs, NPTEL/SWAYAM, Coursera, Edex etc. Credit shall be awarded to students for completion of such courses.

2.0 Department of Information Science and Engineering

(Accredited by National Board of Accreditation, New Delhi)

2.1 Vision of the Department:

Become a premier institution imparting quality education in engineering and management to meet the changing needs of society.

2.2 Mission of the Department:

- Create environment conducive for continuous learning through quality teaching and learning processes supported by modern infrastructure.
- Promote Research and Innovation through collaboration with industries.
- Inculcate ethical values and environmental consciousness through holistic education programs.

2.3 About the Department:

The department of Information Science and Engineering established in the year 2001 offers UG, M. Sc by research and Ph. D programmes. The department is accredited by NBA for the academic years 2019 to 2022. The ever-expanding role of IT in Education, Entertainment, Business Enterprises, Industry, Science, and Public & Private Sectors has influenced personal lives to a great extent. This has compelled the need to remain on the cutting edge of the technology in order to provide quick and easy access to information. ISE@GAT responds to this by producing graduates with much needed technical knowledge & skills capable of developing professional products and services. Teaching methods blend both the traditional modes and modern styles covering case studies, group discussions, project-based learning, participative workshops & seminars leading to conceptual understanding. Department focuses prominently on providing the students career opportunities in the areas of programming, networking, Management Information Systems, Human Computer Interaction, and Information security. Students would be able to relate the knowledge and skills acquired to the work environment. The friendly and supportive environment in the department encourages students and staff to develop innovative ideas for implementation, conduct seminars/workshops/ FDP, Poster Presentations, and various other co-curricular and extracurricular activities. The department is proud of its strong research culture among staff and students.

3.0 Salient Features of Autonomy

Autonomous institutions occupy pivotal positions and are the key interfaces between the industry and academia. Autonomous institutions can create the key channels required for scientific and industrial research and innovation, inclusive teaching and training, and initiatives to develop the eco system for creating more employment.
Autonomy means freedom and authority in academic matters. Autonomy bestows the teacher with the right to decide what to teach, how to teach, how much to teach and whom to teach.

Autonomy gives the privilege to:

- Run courses relevant to requirements of industries and society at large.
- Design Teaching-Learning methodologies, Assessment Tools and Methods, and Admission policies.
- Create an eco- system for holistic development of the individuals.
- Build strong academia and industry interface.
- Build the reputation of the institution through quality education.
- Industry relevant value-added courses during vacations.
- Internships in Industry/ R&D establishments in summer holidays.
- Building leadership qualities including spirit of tolerance and teamwork.
- There will be a lot of scope for industry- oriented skill development built-in into the system.
- Deliver engineering graduates who can effectively shoulder the responsibility of building a strong and vibrant INDIA.

GAT has Board of Governance, Academic Council, Boards of Studies, Boards of Examination, Finance Committee, and Institute Steering Committee. Stakeholders in these bodies comprise of Academicians, Researchers, Industry Experts, Faculty and Alumni. Governing Body of the autonomous college lays down policies and procedures for Governance of the college carried out through the Principal of the college. Academic Council is the apex academic body of the college responsible for approval of schemes of study, syllabi, examinations and evaluation methods, declaration of results, recommendation of candidates to the University for Award of degrees etc. The college constitutes different Boards of Studies for different branches of engineering. The BOS's are responsible for framing of schemes of study and detailed curricula, academic rules etc. Other bodies like Finance Committee, Recruitment Committee help in administration of the college.

3.1 Outcome Based Education (OBE):

Outcome based education (OBE) is student-centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitude. Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behavior a graduate is expected to attain upon completion of a program and after 4 to 5 years of graduation.
The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher-education system in India. It means that an Engineering graduate from India can be employed in any one of the

other countries who have signed the accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model. So, for an Engineering Institution to be accredited by NBA it should compulsorily follow the OBE model.

The OBE model measures the progress of the graduate in three parameters, which are:

- Program Educational Objectives (PEO)
- Program Outcomes (PO)
- Course Outcomes (CO)

Outcome Based Education assesses students' performance, knowledge and skills through quiz, solving puzzles, giving an online presentation, modelling something, taking up a multiple-choice assessment. Assessments are criterion-focused which the students achieve during the learning period. Students are expected to go with the flow, think out of the box in order to implement outcome based education.

Students studying in an accredited program of an institution in India can be confident of getting an education which is of assured quality comparable to global standards. They can compete with their global counterparts for securing jobs in Multi-National Companies and other enterprises across the world. Students can also have global mobility- can work anywhere -in any corner of the globe. In addition, students will have access to the state-of-the-art facility, infrastructure, and access to highly qualified teaching faculty in an accredited program. Students would have acquired "graduate attributes" at the end of the course and will be industry ready. A student can also get into post-graduation and research.

3.2 Advantages of Outcome Based Education:

- Student-centered - It is an approach by which the learner's mastery over a particular skill is demonstrated and measured.
- Clarity in focus - A learning outcome must be made obvious to the learner even at the outset of learning. This outcomes-based model works on bringing out the specific outcomes from the learners.
- The curriculum is designed with a clear definition, outlining the expected outcomes. This will pave a way to achieve the expanded opportunities in the student's performance.
- Exceeding expectations - All students can deliver the highest level of performance. The only kick start needed is to make them believe and encourage, the only way to attain high expectation.
- Expanded opportunities - It means giving countless chances and ways to show the students that they have met with their objective. Not all learners learn the same thing, the same way, and at the same time. However, extended opportunities can help achieve high standards. They help students to learn what is mostly needed for the time and hour.

3.3Program Outcomes (POs) as prescribed by National Board of Accreditation (NBA):

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, 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.

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 teamwork: 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.

3.4Program Specific Outcomes (PSO):

- **PSO1**- Analyze, develop, debug and test application software to meet specified requirements.
- **PSO2**- Understand and analyze the system architecture, organization of computer communication systems.
- **PSO3**- Understand the features of system software in information systems.
- **PSO4**- Design and develop applications for information security.

3.5 Some Definitions:

"Course" is a unit of teaching, which encompasses various topics, that typically lasts one semester, is led by one or more faculty and has fixed registered students. **Course** means a subject either theory or practical identified by its title and code number.

For example:

20MAT11 is a course introduced during 20**20**, offered by **Ma**thematics Department, during **1**st semester; and is the **1**st subject of the scheme.

20CSE32 is a course introduced during 20**20**, offered by **C**omputer **S**cience Department, during **3**rd semester, and is the **2**nd subject of the scheme.

"Program"– cohesive arrangements of courses, co- curricular extra-curricular activities to accomplish predetermined objectives leading to award of a Degree.

"Degree"-Academic award conferred upon a student on successful completion of a program designed to achieve the defined attributes.

3.6 Choice Based Credit System (CBCS):

Major Benefits: Major benefits accruing by adopting the Credit System are listed below:

- Quantification and uniformity in the listing of courses for all programmes at a college, like core (hard/soft), electives and project work.
- Ease of allocation of courses under different heads by using their credits to meet national /international practices in technical education.
- Convenience to specify the minimum/ maximum limits of course load and its average per semester in the form of credits to be earned by a student.
- Flexibility in programme duration for students by enabling them to pace their course load within minimum/maximum limits based on their preparation and capabilities.
- Wider choice of courses available from any department of the same College or even from other similar Colleges, either for credit or for audit.
- Improved facility for students to optimize their learning by availing of transfer of credits earned by them from one College to another.

As the *Credit System* has many advantages over the conventional system of organizing academic programs, GAT has introduced an appropriate *Choice Based Credit System (CBCS)* for the various programs. This will be of great benefit to the students in their preparations to meet the challenging opportunities ahead. In the *Credit System*, the course work of students is unitized, and each unit is assigned *one credit* after a student completes the teaching-learning process as prescribed for that *unit* and is successful in its assessment. However, there are different definitions followed in academic circles for the size of a *unit* and in turn, for a *credit.*

3.7 Credit Definition:

As it is desirable to have uniformity in the definition of *credit* across all Autonomous Colleges under the University, the following widely accepted definition for *credit* shall be followed at GAT. This can

provide the good flexibility to the students and also strengthens *CBCS* under the University. Here, *one unit of course work* and its corresponding *one credit* (while referring to a Main Semester) shall be equal to:

i. Theory course conducted for 1 hour/week/ semester;
ii. Laboratory course or Tutorial conducted for 2 hours/week/semester.

The following additional factors may also be noted in this connection:

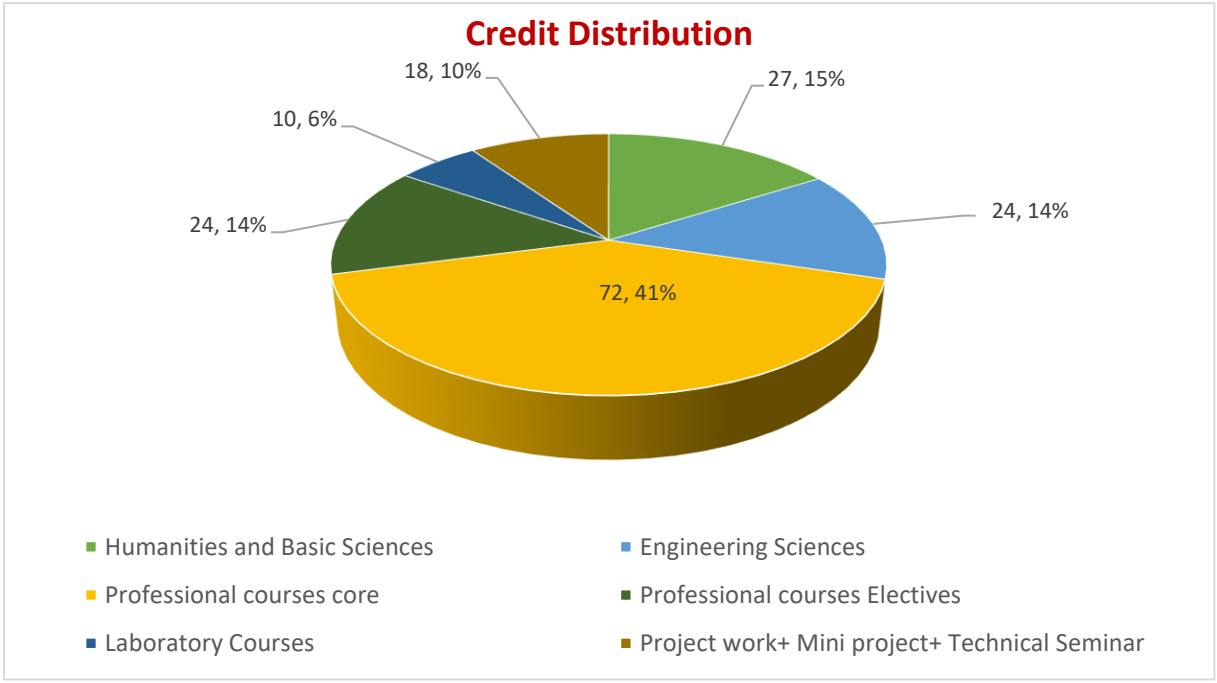
- The above figures shall be multiplied by a factor of 2 in the case of the Supplementary Semester,
- Other student activities which are not demanding intellectually, or which do not lend to effective assessment, like practical training, study tours, attending guest lectures shall not carry any credit.

Audit Courses: In Addition, a student can register for courses for *audit* only with a view to supplement his/her knowledge and/or skills. Here also, the student's grades will have to be reflected in the *Grade Card.* These courses shall not be considered in determining the student's academic performance in the semester. In view of this, it may not be necessary for the college to issue any separate transcript covering the audit courses to the registrants at these courses.

For more details on the academic regulations, students are advised to refer Academic Rules and regulations document available on the college website www.gat.ac.in.

3.8 Credit Distribution among Curricular components:

Sl. No.	Curricular Component	Credits allocated	Percentage of allocation
1	Humanities and Basic Sciences	27	**15**
2	Engineering Sciences	24	**14**
3	Professional courses core	72	**41**
4	Professional courses Electives	24	**14**
5	Laboratory Courses	10	**06**
6	Project work+ Mini project+ Technical Seminar	18	**10**
	Total	**175**	**100**



III & IV SEMESTER
SCHEME AND SYLLABUS

Department of Information Science
And
Engineering

Applicable from 2020-21

Global Academy of Technology
(Autonomous Institution Affiliated to VTU)
Draft Scheme of Teaching and Examination 2020-21
Department of Information Science and Engineering

III SEMESTER -UG

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	20MAT31	Discrete Mathematics and Transform Calculus	Mathematics	3	2	--	03	50	50	100	4
2	PC	20ISE32	UNIX Shell Programming	ISE	3	2	--	03	50	50	100	4
3	PC	20ISE33	Data Structures	ISE	3	2	--	03	50	50	100	4
4	PC	20ISE34	Digital Logic Design	ISE	3	2	--	03	50	50	100	4
5	PC	20ISE35	Computer Organization and Architecture	ISE	3	-	--	03	50	50	100	3
6	PC	20ISE36/ 20MATDIP36	Operating Systems/Dip. Mathematics	ISE/ Mathematics	3	-	--	03	50	50	100	3
7	PC	20ISEL37	Data Structures Laboratory	ISE	--	-	2	03	50	50	100	1
8	PC	20ISEL38	Digital Logic Design Laboratory	ISE	--	-	2	03	50	50	100	1
9	NCMC	NCMC3	Non Credit Mandatory Course 3	**Personality Development & Communication Skills (PD &C)**								
10	HSM	20KVK39/49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	0
		20KAK39/49	Aadalitha Kannada (Kannada for Administration)									
		OR			OR							0
		20CPH39	Constitution of India, Professional Ethics and Cyber Law		1	-	--	-	100	-	100	
				TOTAL	**18/19**	**8/10**	**04**	**24**	**500**	**400**	**900**	**24**

Note: BSC: Basic Science, PC: Professional Core, PE- Professional Elective, HSM: Humanity and Social Sciences, NCMC: Non-credit mandatory course.

20KVK39: Vyavaharika Kannada (Kannada for communication) is for non-kannada students and 20KAK39 Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs
((a) Additional Mathematics 20MATDIP36 is prescribed for lateral entry **Diploma holders** admitted to III semester BE. The students shall attend the classes during this semester to complete all the formalities of the course and appear for the examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students must fulfil the requirements during subsequent semester/s to appear for SEE. This course shall be considered for vertical progression. **(b)** The **Regular students (Non-Diploma)** shall study the core subject **20XXX36.**
Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs
Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses **Computer Aided Engineering Drawing and Engineering Mechanics of the First Year Engineering Program**. These courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.
NCMC3: Student can participate in any **Personality Development & Communication Skills Program** (minimum 5 days duration) conducted by Training and Placement cell of GAT/any other training organization. Students should be exposed to soft skills. Student should submit participation and successful completion certificate of PD&C for clearing this mandatory course.

***Mathematics Course for Different Programs:**

Sl. No.	Course Code	Course Title	Offered to Program/s
1	**20MAT31A**	Discrete Mathematics and Transform Calculus	Common to CS/IS/AI&DS/AI &ML
2	**20MAT31B**	Complex Variables, Probability and Sampling Techniques	Civil
3	**20MAT31C**	Complex Variables and Probability	Mechanical/Aeronautical
4	**20MAT31D**	Transforms, Numerical Methods and Advanced Linear Algebra	Electrical & Electronics
5	**20MAT31E**	Transforms, Complex Variables and Special Functions	Electronics and Communication

Global Academy of Technology
(Autonomous Institution Affiliated to VTU)
Scheme of Teaching and Examination 2020-21

IV SEMESTER -UG

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	20MAT41A	Graph Theory, Probability and Sampling Techniques	Mathematics	3	2	--	03	50	50	100	4
2	PC8	20ISE42	Design and Analysis of Algorithms		3	2	--	03	50	50	100	4
3	PC9	20ISE43	Microprocessor and Microcontroller		3	2	--	03	50	50	100	4
4	PC10	20ISE44	Object Oriented Concepts using JAVA		3	2	--	03	50	50	100	4
5	PC11	20ISE45	Software Engineering and Agile Methodologies		3	-	--	03	50	50	100	3
6	PC12	20ISE46	Data Communication		3	-	--	03	50	50	100	3
7	PC13	20ISEL47	Design and Analysis of Algorithms Laboratory		-	-	2	03	50	50	100	1
8	PC14	20ISEL48	Microprocessor and Microcontroller Laboratory		-	-	2	03	50	50	100	1
9	NCMC4	20NCMC4	Universal Human Values	HSM	2	-	-	-	100	--	100	0
10	HSM	20KVK39/49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	0
		20KAK39/49	Aadalitha Kannada (Kannada for Administration)									
		OR										
		20CPH39/49	Constitution of India, Professional Ethics and Cyber Law		1	--	--	-	100	-		
				TOTAL	**20/21**	**8/10**	**04**	**24**	**600**	**400**	**1000**	**24**

Note: BSC: Basic Science, PC: Professional Core, PE- Professional Elective, HSM: Humanity and Social Science, NCMC: Non-credit mandatory course.

20KVK39/49 Vyavaharika Kannada (Kannada for communication) is for non-kannada students and 20KAK39/49 Aadalitha Kannada (Kannada for Administration) is for students who speak, read, and write kannada.

NCMC4 Universal Human Values:

This course has been introduced to create high-quality practices and environment backed with human values and professional ethics in institutions of higher education.

Mathematics Course for Different Programs:

Sl. No.	Course Code	Course Title	Offered to Program/s
1	20MAT41A	Graph Theory, Probability and Sampling Techniques	Common to CS/IS/AI&DS
2	20MAT41B	Transform Calculus and Numerical Techniques	Civil
3	20MAT41C	Transforms, Calculus of Variation and Numerical Techniques	Common to Mechanical/Aeronautical
4	20MAT41D	Complex Variables, Probability and Variational Calculus	Electrical & Electronics
5	20MAT41E	Advanced Linear Algebra and Probability	Electronics and Communication

III & IV SEMESTER
SCHEME AND SYLLABUS
Department of Information Science and Engineering
Applicable from 2020-21

SEMESTER – III

Course: Discrete Mathematics and Transform Calculus

(Common for CSE/ISE/AI&DS)

Course Code	**20MAT31A**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:2:0**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Prerequisites:

Course Objectives: Course Objectives: To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn:

CLO1	Logic and Set theory
CLO2	Permutations and Combinations
CLO3	Functions and Relations
CLO4	Fourier series of periodic functions
CLO5	Laplace Transforms

Content	No. of Hours/ RBT levels
Module 1 Basic Connectives and Truth Tables, Logic Equivalence: The Laws of Logic, Logical Implication: Rules of Inference. Quantifiers and the Proofs of Theorems. Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams.	**10 Hours** **L2, L3**
Module 2 The Rules of Sum and Product, Permutations, Combinations, The Binomial Theorem, Combinations with Repetition. The Well Ordering Principle- Mathematical Induction, Recursive Definitions.	**10 Hours** **L2, L3**
Module 3 Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.	**10 Hours** **L2, L3**

Module 4 Laplace transforms of elementary functions, Laplace transforms of Periodic functions, unit-step function and Dirac delta function. Inverse Laplace Transform, Convolution theorem (without Proof), Solution of second order linear differential equations using Laplace transform.	**10 Hours** **L2, L3**
Module 5 Fourier series of periodic functions, Complex form of Fourier series. Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms.	**10 Hours** **L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO31.1	Use computational techniques essential for the study of mathematical logic, set operations, counting principles, relations and functions.
CO31.2	Determine Laplace and inverse Laplace transforms of given functions leading to the solution of linear differential equations.
CO31.3	Apply Fourier series to transform periodic signals into fundamental frequencies
CO31.4	Apply Fourier Transforms to transform continuous time signals from time domain to frequency domain and vice versa

Textbooks:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2020.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017

Reference books:

1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007
2. E. Kreyszig , Advanced Engineering Mathematics, John Wiley & Sons 10th Edition, 2016
3. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6 th Edition, 2014

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO31.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO31.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO31.3	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO31.4	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: UNIX Shell Programming

Course Code	20ISE32	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Understand the philosophy of Unix Operating System and Control Unix using command line interface.
CLO2	Understand programming in Bourne Shell, Korn/Bash Shell and C Shell
CLO3	Use regular expressions and Edit streams with sed
CLO4	Understand programming in awk and Perl
CLO5	Understand the interpretation of program development tools for networking and security

Content	No. of Hours/ RBT levels
Module 1 **Unix Architecture and Command Usage:** Architecture of Unix, Features of Unix, POSIX and Single UNIX specification, Internal and External commands, Command structure. Unix Commands- echo, printf, script, passwd, uname, who, date, tty, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, cmp, diff , man browsing and manual pages on-line. **File System:** The parent – child relationship, the HOME and PATH variable, pwd, cd, mkdir, rmdir, absolute pathname, relative pathname. **File Attributes:** The UNIX file system, ls –l, -d option, file ownership, changing file permissions, chmod, directory permissions, changing file ownership.	**10 Hours** **L2,**
Module 2 **More File Attribute:** File systems and inodes, hard links, symbolic links and ln, the directory, umask, modification and access times, find. **Filters using regular expressions:** pr, head, tail, cut, paste, sort, uniq, tr, grep and sed: grep, Basic Regular Expressions (BRE), Extended Regular Expressions (ERE) and egrep.	**10 Hours** **L3**
Module 3	

Process: ps: process status, system processes (-e or –a), mechanism of process creation, process states and zombies, running jobs in background, nice: job execution, job control. **Shell Programming:** The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection, Pipes, tee, command substitution, shell variables. Shell programming: Ordinary and environment variables. The .profile. Read and read-only commands. Command line arguments. Exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples.	**12 Hours** **L3**
Module 4 **Advanced Filters and Programming:** Awk filtering, printf, variables and expressions, number processing, Arrays, functions, control flow, looping constructs. Perl preliminaries, chop function, variables and operators, string handling functions, foreach, split, join, associative arrays, file handling, file tests.	**10 Hours** **L3**
Module 5 **Program Development Tools:** Handling Multisource C applications, make, ar. TCP/IP basics, Resolving IP addresses, The applications, ping, telnet,ftp, Maintaining security, Partitions and file systems, The standard file systems and their types, fdisk, mkfs, mounting and un mounting file systems, fsck.	**08 Hours** **L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO32.1	Explain multi user OS UNIX and its basic features
CO32.2	Interpret UNIX Commands, Shell basics, and shell environments
CO32.3	Develop shell programming, communication, System calls and terminology.
CO32.4	Interpret Perl script commands for programming
CO32.5	Interpret tools for networking and security.

Textbooks: 1. **Unix Concepts and Applications**, Sumitabha Das, 4th Edition., Tata McGraw Hill (Chapters 2.1 to 2.10, 3.3 to 3.6, 3.9 to 3.12, 4, 5, 6, 8, 9, 11, 12, 13, 14, 17.1 to 17.6, 18, 19, 22.1 to 22.4, 25.1 to 25.7

Reference Books:

1. **UNIX and Shell Programming**, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning – India Edition. 2009.
2. **UNIX & Shell Programming** , M.G. Venkatesh Murthy, Pearson Education.

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
20IS32.1	3	3	-	-	-	-	-	-	-	-	-	1	1	1	-	-
20IS32.2	3	3	3	-	3	-	-	1	-	-	-	1	1	1	-	-
20IS32.3	3	3	3	-	3	-	-	1	-	-	-	1	1	-	-	-
20IS32.4	3	3	3	3	3	2	-	1	-	-	-	2	1	-	-	-
20IS32.5	3	3	3	3	3	2	-	1	-	-	-	2	1	-	-	-
Average	3	3	3	3	3	2	-	1	-	-	-	1.4	1	1	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Data Structures

Course Code	20ISE33	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Explain fundamentals of data structures and their applications essential for Programming /problem solving.
CLO2	Find suitable data structure during application development/Problem Solving.
CLO3	Illustrate linear representation of data structures: Stack, Queues, Lists,
CLO4	Explain Non Linear representation of data structures like Trees and Graphs and its memory Representation.
CLO5	Demonstrate sorting and searching algorithms

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays. **Array Operations:** Traversing, inserting, deleting, searching, and sorting. Polynomials and Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples, Pattern matching algorithms-Brute force, The Knuth-Morris-Pratt algorithm	**10 Hours L3**
Module 2 **Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, Multiple Stacks and Queues.	**10 Hours L3**

Programming Examples.	
Module 3 **Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation. Linked list operations: Traversing, Searching, insertion, and Deletion. Doubly Linked lists, Circular linked lists, Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples	**10 Hours L3**
Module 4 **Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, Postorder, preorder; Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression, Programming Examples	**10 Hours L3**
Module 5 **Advanced Trees:** AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, B+ Trees. **Sorting and Searching:** Insertion Sort and Radix sort **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.	**10 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO33.1	Explain the basic data structures and its representation in memory
CO33.2	Apply appropriate algorithm for problem solving using arrays, strings, stacks, queues.
CO33.3	Explain the representation of linked lists, trees and hashing in memory.
CO33.4	Write programs using linked lists and tree for a given specification.
CO33.5	Implement algorithms for searching and sorting.

Textbooks:

1**. Fundamentals of Data Structures in C**, Ellis Horowitz and SartajSahni,2nd Ed, Universities Press, 2019.

2. **Data Structures using C**, A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education

Reference Books:

1**. Data Structures**: A Pseudo-code approach with C, Gilberg & Forouzan, 2nd Ed, Cengage Learning,2014.

2. **Data Structures using C**, Reema Thareja, 3rd Ed, Oxford press, 2018.

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

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Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20IS33.1	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20IS33.2	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20IS33.3	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20IS33.4	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20IS33.5	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
Average	3	3	2		2	-	-	-	-	-	-	3	3	-	-	-

Low-1: Medium-2: High-3

SEEMESTER – III

Course: Digital Logic Design

Course Code	20ISE34	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites: 20ELN26-Elements of Electronics Engineering

Course Objectives:

CLO1	Understand the basic digital principles and working of various logic gates, and different techniques for simplification of Boolean function.
CLO2	Design combinational logic circuits and describe their applications
CLO3	Analyse working of Flip Flops and sequential circuits for given problems
CLO4	Analyse and design a synchronous and asynchronous counter.
CLO5	Analyse and design a Synchronous and Asynchronous Sequential Circuits

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** Digital Principles, Digital Logic, Combinational Logic Circuits: Definitions for Digital Signals, Digital Waveforms, Gates: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method	**10 Hours** **L3**
Module 2 **Data-Processing Circuits:** Multiplexers, Demultiplexers, 1-of-16 Decoder, Encoders, Exclusive-or Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays	**10 Hours** **L3**
Module 3 **Flip-Flops:** Clock Waveforms, TTL Clock, Clocked D FLIP-FLOP, Edge-triggered D FLIP-FLOP, Edge-triggered JK FLIP-FLOP, FLIP-FLOP Timing, JK Master-slave FLIP-FLOP, Switch Contact Bounce Circuits, Various Representation of FLIPFLOPs, Analysis of Sequential Circuits	**10 Hours** **L3**
Module 4 **Registers:** Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial	**102Hours** **L3**

Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers. Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Pre-settable Counters, Counter Design as a Synthesis problem.	
Module 5 **Design of Synchronous and Asynchronous Sequential Circuits:** Design of Synchronous Sequential Circuit: Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, State Reduction Technique.	**10 Hours** **L3,**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO34.1	Demonstrate the various techniques to minimize the combinational functions.
CO34.2	Develop different combinational and sequential circuits using Logic gates, Multiplexers Decoders, PLA, Flip flops.
CO34.3	Design various data processing circuits and describe behaviour of various digital circuits.
CO34.4	Design synchronous and asynchronous counters.
CO34.5	Design sequential logic circuits using different models.

Textbooks:

1. **Digital Logic and Computer Design**, M Morris Mano: 14th Impression, Pearson, 2012.

ISBN 978-81-7758-409-7.

Reference Books:

1. **Logic Design**, R D Sudhakar Samuel, K.S. Nandini Prasad: 1st edition, Elsevier Publication, 2013.
2. **Fundamentals of Logic Design**, Charles H. Roth: Jr., 5th Edition, Thomson, 2004

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

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Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO34.1	3	3	2	-	-	-	-	-	-	1	-	-	-	2	-	-
CO34.2	3	3	2	-	-	-	-	-	-	1	-	-	-	2	-	-
CO34.3	3	2	1	-	-	-	-	-	-	1	-	-	-	2	-	-
CO34.4	3	2	1	-	-	-	-	-	-	1	-	-	-	2	-	-
CO34.5	3	2	1	-	-	-	-	-	-	1	-	-	-	2	-	-
Average	3	2	1	-	-	-	-	-	-	1	-	-	-	2	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Computer Organization and Architecture

Course Code	20ISE35	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Understand the basic sub systems of a computer, their organization, structure and operation.
CLO2	Illustrate organization of basic processing unit and different ways of communicating with I/O devices.
CLO3	Describe internal organization of memory and the concepts of cache memory.
CLO4	Interpret arithmetic and logical operations with integer and floating-point operands.
CLO5	Understand the fundamentals of computer architecture and concepts of pipelining.

Content	No. of Hours/ RBT levels
Module 1 **Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Additional Instructions	**8 Hours L3,**
Module 2 **Input/output Organization:** Basic Input and Output Operations, Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Direct Memory Access, Buses **Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization	**8 Hours L3,**

Module 3 **Memory System:** Basic Concepts, Semiconductor RAM Memories – Internal organization of memory chips, Static memories, Asynchronous and synchronous DRAM, Structure of larger memories, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations – Hit rate and miss penalty	**8 Hours L3,**
Module 4 **Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication- Bit-pair recoding of multipliers, Integer Division, Floating-point Numbers and Operations.	**8 Hours L3,**
Module 5 **Fundamentals Of Computer Design:** Defining computer architecture, Quantitative Principles of computer design. Pipelining: Basic and Intermediate **Concepts:** Introduction, Pipeline hazards, Implementation of pipeline, What makes pipelining hard to implement? **Instruction –Level Parallelism:** ILP: Concepts and challenges.	**8 Hours L3,**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO35.1	Understand the basic structure of computers, machine instructions and addressing modes.
CO35.2	Illustrate the concept of interrupts , DMA and basic processing unit
CO35.3	Describe the internal organization of memory and the mapping of cache memory
CO35.4	Apply arithmetic operations on binary numbers at circuit level.
CO35.5	Illustrate the fundamentals of computer architecture and concepts of pipelining

Textbooks:

1. **Computer Organization**- Carl Hamacher, ZvonkoVranesic, SafwatZaky:, 5th Edition, Tata McGraw Hill,2018
2. **Computer Architecture, A Quantitative Approach** – John L. Hennessey and David A. Patterson, 4th Edition, Elsevier, 2017.

Reference books:

1. **Computer Organization & Architecture** - William Stallings, 10th Edition, Pearson, 2016.
2. **Advanced Computer Architecture Parallelism, Scalability** – Kai Hwang, Programmability, Tata Mc Grawhill, 2017.

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)

4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

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	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20IS35.1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-
20IS35.2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20IS35.3	2	1	1	-	-	-	-	-	-	-	-	1	1	-	-	-
20IS35.4	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
20IS35.5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2	1	1	-	-	-	-	-	-	-	-	1	1	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Operating Systems

Course Code	20ISE36	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Understand concepts and terminology used in OS
CLO2	Illustrate process scheduling and synchronization with semaphores
CLO3	Illustrate the concept of deadlocks and memory management
CLO4	Explain Virtual memory management and file system
CLO5	Discuss secondary storage structure and its protection

Content	No. of Hours/ RBT levels
Module 1 **Introduction to operating systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security. **Operating System Services;** User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines.	**08 Hours L2**
Module 2 **Process Management** Process concept; Process scheduling; Operations on processes; Inter process communication. Process **Synchronization**: synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors	**08Hours L3**
Module 3 **Deadlocks :** Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery	**08 Hours L3**

from deadlock. **Memory Management**: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	
Module 4 **Virtual Memory Management**: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **File System, Implementation of File System**: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	**08 Hours** **L3**
Module 5 **Secondary Storage Structures, Protection**: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems**.**	**08 Hours** **L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO36.1	Discuss the fundamentals of operating system and its services
CO36.2	Describe process management and synchronization
CO36.3	Illustrate concept of Deadlock and memory management
CO36.4	Discuss the concept of virtual memory management and file systems
CO36.5	Understand the secondary storage management with its protection

Textbooks:

1. **Operating System**, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Principles, 10th edition, Wiley-India, 2018

Reference books:

1**. Operating Systems**: A Concept Based Approach , D.M Dhamdhere, McGraw- Hill, 2018.

2. **Operating Systems**: Internals and Design Principles, William Stallings, 6th Edition, Pearson

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISE36.1	3	-	-	-	-	-	-	-	-	-	-	3	-	-	3	-
20ISE36.2	3	2	2	2	-	-	-	-	-	-	-	3	-	-	3	-
20ISE36.3	3	2	2	2	-	-	-	-	-	-	-	3	-	-	3	-
20ISE36.4	3	2	2	2	-	-	-	-	-	-	-	3	-	-	3	-
20ISE36.5	3	2	2	2	-	-	-	-	-	-	-	3	-	-	3	-
Average	3	2	2	2	-	-	-	-	-	-	-	3	-	-	3	-

Low-1: Medium-2: High-3

SEMESTER -III

COURSE: Data Structures Laboratory

Subject Code	20ISEL37	CIE Marks	50
Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Examination Hours	03

Course Objectives:

CLO1	Apply Linear data structures such as stacks, queues and lists in problem solving
CLO2	Demonstrate Non-Linear data structures such as trees and their representation in memory
CLO3	Demonstrate Sorting and Searching algorithms
CLO4	Demonstrate the working of different types of data structures and their applications using high level language

Sl. No.	Experiments	No. of Hours/ RBT levels
	Part- A	
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position(POS) d. Deleting an Element at a given valid Position(POS) e. Exit. Support the program with functions for each of the above operations.	**L3**
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String(REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of	**L3**

	PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Builtin functions.	
3	a. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations	**L3**
4	Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Characters (Array Implementation of QUEUE with maximum size MAX) a. Enqueue an Element on toQueue b. Dequeue an Element fromQueue c. Demonstrate how Queue can be used as circular Queue d. Demonstrate Overflow and Underflow situations onQueue e. Display the status of Queue f. Exit	**L3**
5	Support the program with appropriate functions for each of the above operations a. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^(Power) and alphanumeric operands. b. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /,%,	**L3**
6	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: *USN, Name, Programme, Siphon* a. Create a SLL of N Students Data by using *front insertion*.	**L3**

	b. Display the status of SLL and count the number of nodes init c. Perform Insertion / Deletion at End ofSLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) f. Exit	
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: *SSN, Name, Dept, Designation, Sal, PhNo* a. Create a DLL of N Employees Data by using *endinsertion*. b. Display the status of DLL and count the number of nodes init c. Perform Insertion and Deletion at End ofDLL d. Perform Insertion and Deletion at Front ofDLL e. Demonstrate how this DLL can be used as Double EndedQueue. Exit	**L3**
8	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers . a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5,2 b. Traverse the BST in Inorder, Preorder and PostOrder c. Search the BST for a given element (KEY) and report the appropriatemessage Exit	**L3**
9	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using probing	**L3**
10	Design, Develop and Implement a menu driven Program in C for the following operations on a. Radix Sort b. Insertion Sort	**L3**

Course Outcomes: Upon successful completion of this course, student will be able to:

CO37L.1	Execute C programs to perform operations on arrays and strings without using built-in functions.
CO37L.2	Implement stack and queue operations using array.
CO37L.3	Demonstrate stack and queue operations using linked lists.
CO37L.4	Execute Binary search Tree traversal using linked lists.
CO37L.5	Demonstrate the concepts of Hashing and Sorting.

Textbooks:

1. **Fundamentals of Data Structures** Ellis Horowitz and Sartaj Sahni, in C, 2nd Ed, Universities Press, 2019.
2. **Data Structures using C** – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education

Reference Books:

1. **Data Structures**: A Pseudo-code approach with C, Gilberg&Forouzan, 2nd Ed, Cengage Learning, 2014.
2. **Data Structures using C**, Reema Thareja, 3rd Ed, Oxford press, 2012.

Scheme of Examination:

Semester End Examination (SEE):

SEE for the practical courses will be based on experiment conduction with proper results, and is evaluated for 50 marks that include 40 marks for conduction and Viva is for 10 marks

Total SEE for laboratory is 50 marks.

Continuous Internal Evaluation (CIE):

The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The Average Marks (AM) over number of weeks is considered for 30 marks. At the end of the semester a Test (T) is conducted for 20 marks.

Total CIE for laboratory is 50 marks.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISL37.1	3	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20ISL37.2	3	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20ISL37.3	3	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20ISL37.4	3	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-
20ISL37.5	2	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-
Average	3	2	2	-	2	-	-	-	-	-	-	3	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER -III

COURSE: Digital Logic Design Laboratory

Subject Code	20ISEL38	CIE Marks	50
Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Examination Hours	03

Course Objectives:

CLO1	Understand the working principles of various logic gates. Verify Demorgan's theorem & realization SOP & POS expressions
CLO2	Design combinational logic circuits and describe their applications.
CLO3	Understand the working of Multiplexers for given logic expressions
CLO4	Understand the working of Flip Flops and sequential circuits for given problems & Design the synchronous, asynchronous counter and Sequential Circuits

Sl. No.	Experiments	No. of Hours/ RBT levels
1	Verification of Demorgan's theorem & realization SOP & POS expressions	**L3**
2	Design and verify the Truth table of 3-bit parity generator and 4-bit parity checker using logic gates with an even parity bit.	**L3**
3	Design and implement half adder, Full Adder, Half Subtractor, Full Subtractor using logic gates.	**L3**
4	Design a 4-bit parallel adder/Subtractor using IC 7483.	**L3**
5	Design and implement code converter I) Binary to Gray (II) Gray to Binary Code using basic gates	**L3**
6	Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC.	**L3**
7	Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.	**L3**
8	Design and implement a Ring Counter using 4-bit shift register.	**L3**

9	Design and implement a mod-n (n<9) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.	**L3**
10	Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7-segment display (using IC-7447)	**L3**

Course Outcomes: Upon successful completion of this course, student will be able to:

CO1	Implement circuits involving various digital logic gates
CO2	Construct Combinational Logic Circuits including Adders, Sub tractors, code converters
CO3	Implement 8:1 Multiplexer for a given logical expressions
CO4	Implement a Ring Counter using 4-bit shift register
CO5	Implement Sequential Logic Circuits including J-K Master Slave Flip- Flops, Synchronous and Asynchronous Counter

Textbooks:

1. **Morris Mano**: Digital Logic and Computer Design, 14th Impression, Pearson, 2012, ISBN 978-81-7758-409-7.

References:

1. **R D Sudhakar Samuel, K.S. Nandini Prasad**: Logic Design, 1st edition, Elsevier Publication, 2013.
2. **Charles H. Roth:** Fundamentals of Logic Design, Jr., 5th Edition, Thomson, 2004

Scheme of Examination:

Semester End Examination (SEE):

SEE for the practical courses will be based on experiment conduction with proper results, and is evaluated for 50 marks that include 40 marks for conduction and Viva is for 10 marks

Total SEE for laboratory is 50 marks.

Continuous Internal Evaluation (CIE):

The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The Average Marks (AM) over number of weeks is considered for 30 marks. At the end of the semester a Test (T) is conducted for 20 marks.

Total CIE for laboratory is 50 marks.

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO38.1	3	3	1	-	-	-	-	-	2	2	-	-	-	2	-	-
CO38.2	3	3	1	-	-	-	-	-	2	2	-	-	-	2	-	-
CO38.3	3	1	1	-	-	-	-	-	2	2	-	-	-	2	-	-
CO38.4	3	1	1	-	-	-	-	-	2	2	-	-	-	2	-	-
CO38.5	3	1	1	-	-	-	-	-	2	2	-	-	-	2	-	-
Average	3	1	1	-	-	-	-	-	2	2	-	-	-	2	-	-

Low-1: Medium-2: High-3

SEMESTER – III/IV

Course: Kannada for Administration

(ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

(ಕನ್ನಡಿಗರಿಗಾಗಿ – **for Kannadigas** - Common to all branches)

[As per Outcome Based Education (OBE) and Choice Based Credit System (CBCS) scheme]

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡದ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡವನ್ನು, ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡದಲ್ಲಿ ತಾಂತ್ರಿಕ ವಿಜ್ಞಾನಗಳ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಹಲವಾರು ವಿಷಯಗಳನ್ನು ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಪರಿವಿಡಿ

ಭಾಗ – ಒಂದು ಲೇಖನಗಳು

ಕನ್ನಡ ನಾಡು, ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ : ಹಂಪ ನಾಗರಾಜಯ್ಯ

೨. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಭಾಗ – ಎರಡು

ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)

೪. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.

೫. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸ
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೆ – ಕನಕದಾಸ

೬. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫ
ಶಿವಯೋಗಿ – ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ

೭. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ, ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ

ಭಾಗ – ಮೂರು

ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

೮. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ.

೯. ಕುರುಡು ಕಾಂಚಾಣಾ : ದ.ರಾ. ಬೇಂದ್ರೆ

೧೦. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

೧೧. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ

೧೨. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

೧೩. ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

೧೪. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಭಾಗ – ನಾಲ್ಕು

ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

೧೫. ಡಾ. ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ – ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್

೧೬. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ

೧೭. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ – ಐದು

ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

೧೮. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

೧೯. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್*

೨೦. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ*

೨೧. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು*

* **(ಅಧ್ಯಾಯ 3, 19, 20 ಮತ್ತು 21 ಇವುಗಳು ವಿತಾವಿ ಯದಿಂದ ಪ್ರಕಟಿತ " ಆಡಳಿತ ಕನ್ನಡ "** ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನಗಳು – **ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ** ಮತ್ತು **ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ.**

ಸಂಪಾದಕರು

ಡಾ. ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ
ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು,
ಮಾನವಿಕ ಮತ್ತು ಸಾಮಾಜಿಕ ವಿಜ್ಞಾನಗಳ ವಿಭಾಗ,
ಸರ್ಕಾರಿ ಇಂಜಿನಿಯರಿಂಗ್ ಕಾಲೇಜು, ಹಾಸನ.

ಪ್ರಕಟಣೆ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

2020

Scheme of Examination:

There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 1.

Table 1: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

SEMESTER – III/IV

Course: Kannada for Communication (for Non-Kannadiga Students)

Course Code	20KVK39/49	CIE Marks	100
Hours/Week (L: T: P)	0:2:0	SEE Marks	-
No. of Credits	0	Examination Hours	-

Course Learning Objectives:

The course will enable the non Kannadiga students to understand, speak, read and write Kannada language and communicate (converse) in Kannada language in their daily life with kannada speakers.

Table of Contents

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

Part – I Lessons to teach and Learn Kannada Language

Lesson – 9	ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು **Accusative Cases and Potential Forms used in General Communication**
Lesson – 10	"ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
Lesson – 11	ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ Comparitive, Relationship, Identification and Negation Words
Lesson – 12	ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು Different types of forms of **Tense, Time and Verbs**
Lesson – 13	ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ Formation of Past, Future and Present Tense Sentences with Verb Forms
Lesson – 14	ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರೆ ಮಾಹಿತಿಗಳು Karnataka State and General Information about the State
Lesson – 15	ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ - Kannada Language and Literature
Lesson – 16	ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನುಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು Do's and Don'ts in Learning a Language
Lesson – 17	**PART - II** **Kannada Language Script Part – 1**
Lesson – 18	**PART - III** **Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Words in Conversation**

ಲೇಖಕರು

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು
ಮಾನವಿಕ ಮತ್ತು ಸಾಮಾಜಿಕ ವಿಜ್ಞಾನಗಳ ವಿಭಾಗ
ಸರ್ಕಾರಿ ಇಂಜಿನಿಯರಿಂಗ್ ಕಾಲೇಜು - ಹಾಸನ

ಪ್ರಕಟಣೆ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

2020

Scheme of Examination:

There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 1.

Table 1: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

SEMESTER – III/IV

Course: Constitution of India, Professional Ethics and Cyber Law

Course Code	20CPH39/49	CIE Marks	100
Hours/Week (L: T: P)	1:0:0	SEE Marks	-
No. of Credits	0	Examination Hours	-

Course Objectives:

CLO1	Know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.
CLO2	Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
CLO3	Know about the cybercrimes and cyber laws for cyber safety measures.

Content	No. of Hours
Module 1 Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.	**03 Hours**
Module 2 Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,371J) for some States.	**03 Hours**
Module 3 Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74,75, 86, and 91,94,95,100,101,118 and some important Case	**03 Hours**

Studies. Emergency Provisions, types of Emergencies and its consequences. Constitutional special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	
Module 4 Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	**03 Hours**
Module 5 Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	**03 Hours**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO39.1	Have constitutional knowledge and legal literacy.
CO39.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO39.3	Understand the cybercrimes and cyber laws for cyber safety measures.

TEXTBOOKS:

1. Constitution of India, Professional Ethics and Human,0 Shubham Singles, Charles E. Haries, and et. al., Cengage Learning India, 2018.
2. Cyber Security and Cyber Laws, Alfred Basta and et. al., Cengage Learning India, 2018

REFERENCE BOOKS:

1. Introduction to the Constitution of India, Durga Das Basu, Prentice –Hall, 2008.
2. Engineering Ethics, M. Govindarajan, S. Natarajan, V. S. Senthilkumar, Prentice –Hall, 2004

Scheme of Examination:
There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 1.

Table 1: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

SYLLABUS

4th semester

SEMESTER – IV

Course: Graph Theory, Probability and Sampling Techniques
(Common for CSE/ISE/AI&DS)

Course Code	**20MAT41**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:2:0**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Prerequisites:

Course Objectives:

CLO1	Graph Theory
CLO2	Probability distributions
CLO3	Stochastic process and Markov chains
CLO4	Sampling distributions and testing of hypothesis

Content	No. of Hours/ RBT levels
Module 1 Graphs, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits. Planar Graphs, Hamiltonian paths and Cycles.	**10 Hours** **L2, L3**
Module 2 Trees, Rooted Trees, Trees and Sorting, Weighted Trees and Prefix Codes. Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees: The algorithms of Kruskal and Prim.	**10 Hours** **L2, L3**
Module 3 Probability, Axioms of probability, Conditional probability, Bayes theorem, Discrete and continuous random variables, Moments, Moment generating functions, Binomial, Poisson, exponential and Normal distributions.	**10 Hours** **L2, L3**
Module 4 Joint distributions, Marginal and conditional distributions, Covariance, Correlation and linear regression. Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability.	**10 Hours** **L2, L3**

Module 5	
Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, student's t-distribution, chi-square distribution as a test of goodness of fit, F- test.	**10 Hours** **L2, L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO41.1	Solve problems using basic graph theory
CO41.2	Solve problems associated with random variables using probability distributions
CO41.3	Solve problems related to testing of hypothesis

Textbooks:

1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2020.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017

Reference books:

4. Kenneth H. Rosen, Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007
5. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons 10th Edition, 2016
6. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6 th Edition, 2014

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.
Typical Evaluation pattern is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO41.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO41.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO41.3	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Design and Analysis of Algorithms

Course Code	20ISE42	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Apply different techniques used in algorithm analysis for solving computational problems.
CLO2	Design appropriate algorithm to solve problems on real world applications
CLO3	Understand different algorithm's design techniques and strategies.
CLO4	Analyse the efficiency of alternative algorithmic solutions for the same problem
CLO5	Apply appropriate data structures to enhance the performance of algorithms for problem Solving

Content	No. of Hours/ RBT levels
Module 1 **Basics of Algorithms Definition**, Fundamentals of Algorithm and Problem Solving — Important Problem Types — Fundamentals of Algorithm Analysis and Efficiency, Time and Space Complexity. **Analysis of Algorithm**: The efficient algorithm, Average, Best and worst case analysis, Amortized analysis, Asymptotic Notations, Mathematical analysis of Non-Recursive and recursive Algorithms with Examples	**10 Hours L3**
Module 2 **Divide and Conquer Algorithm**: Introduction, Recurrence and different methods to solve recurrence. **Problem Solving using divide and conquer algorithm** - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication. **Exploring Graphs**: An introduction to graphs - Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search and Connected components.	**10 Hours L3**

Module 3 **Greedy Algorithm** General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Elements of Greedy strategy, The Knapsack Problem, Job Scheduling Problem, Huffman code. . **Minimum Spanning trees** (Kruskal's algorithm, Prim's algorithm), Single source shortest paths: Dijkstra's Algorithm Decrease and Conquer Approach: Topological Sort.	**10 Hours L3**
Module 4 **Dynamic Programming**: Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, **Transitive Closure**- Warshall's Algorithm, All Points Shortest path, Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem.	**10 Hours L3**
Module 5 **Backtracking and Branch and Bound:** Introduction, The N Queens problem, Knapsack problem, Travelling Salesman problem. **Introduction to NP-Completeness**: The class P and NP, Polynomial reduction, NP-Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.	**10 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO42.1	Demonstrate the Computational Complexity of Algorithms in terms of time and space.
CO42.2	Devise algorithms using divide and conquer, decrease and conquer strategies for a given problem.
CO42.3	Demonstrate Graph algorithms using greedy method, transform and conquer approach to model engineering problems
CO42.4	Solve the given problem using Dynamic Programming.
CO42.5	Use Back Tracking, Branch and Bound algorithm design technique for solving computationally hard problems.

Text Books:

1. **Introduction to the Design and Analysis of Algorithms**, Anany Levitin, 2rd Edition, 2019. Pearson.
2. **Computer Algorithms/C++,** Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

1. **Introduction to Algorithms**, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2.**Design and Analysis of Algorithms**, S. Sridhar, Oxford (Higher Education)

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISE42.1	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-
20ISE42.2	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISE42.3	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISE42.4	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISE42.5	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
Average	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Microprocessor and Microcontroller

Course Code	20ISE43	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	To learn the basics of 8086 Microprocessor to Pentium-core Microprocessor and their functions
CLO2	To understand and implement the 8086 family Assembly Language Programming
CLO3	To explore the I/O interfacing and advanced Microprocessors
CLO4	Expose to the functional architecture of 8051

Content	No. of Hours/ RBT levels
Module 1 **Introduction To Microprocessors:** Introduction–Microprocessors and Microcontrollers its computational functionality and importance, 8086 architecture and Historical background. The Microprocessor–Based Personal Computer Systems, Internal Microprocessor Architecture, Real mode memory Addressing–Protected mode Memory Addressing	**08 Hours L3**
Module 2 8086 Family Assembly Language Programming: Machine language instruction format-Addressing modes-Data addressing, Program memory and stack addressing modes, Instruction Set: Data Movement Instructions. Arithmetic and Logic Instructions, Program control Instructions, Assembler Directives of 8086	**08 Hours L3,**
Module 3 **Programming Concepts:** Using Assembly Language with C/C++ for 16-Bit DOS Applications and 32-Bit Applications, Modular Programming, Using the Keyboard and Video Display, Data Conversions–Example Programs: Binary to ASCII- ASCII to Binary	**08 Hours L3**

Module 4 **I/O Interface & Advanced Microprocessors:** Introduction to I/O Interface. Programmable Peripheral Interface architecture modes, Basic DMA Operations- 8237 DMA Controller architecture-- software commands. Disk Memory Systems. Introduction to Pentium - Pentium Pro Microprocessor-Pentium II- Pentium III- Pentium-IV & Core2	**08 Hours** L3
Module 5 **Architecture And Programming 8051:** Architecture of 8051-Signal Descriptions-Registered, Program Status Word, Memory and I/O Addressing-Addressing modes Instruction set, Timer/Counter-Serial-Interrupt, Basic Programming	**08 Hours** **L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO43.1	Explain physical and logical configuration of memory and addressing modes of Intel 8086 microprocessor.
CO43.2	Make use of 8086 assembly language instruction sets to solve problems
CO43.3	Illustrate the fundamental concepts of modular programming using Assembly Language with C/C++
CO43.4	Understand 8086 hardware and I/O interfacing concepts to connect a peripheral device to the computer.
CO43.5	Outline the functional architecture and basic programming of 8051

Textbooks:

1. Barry B. Brey, "THE INTEL Microprocessors-Architecture, Programming and Interfacing", 8thEdition, Pearson, 2012.(Units I-IV)
2. A.K.Ray and K.M. Bhurchandi, "Advanced Microprocessor and Peripherals" Tata McGraw Hill, 3rdEdition, 2013(Unit-5).
3. Muhammed Ali Mazidi, Janice GillispleMaidi, Rolin.D. McKinlay, "The 8051 Microcontroller and Embedded Systems, Using Assembly and C", Second edition, Pearson Prentice Hall, 2015.

Reference books:

1. N.Senthilkumar, M.Saravanan, S,Jeevanathan, "Microprocessors and Microcontrollers", Oxford University Press, 2011
2. Kenneth J Ayala, "The 8086 Microprocessor: Programming and Interfacing the PC", Cengage Learning, Reprint 2014
3. Kenneth J Ayala, "The 8051 Microcontroller", 3rd edition, Cengage Learning, Reprint 2014..

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)

4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each modulecarrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20IS43.1	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
20IS43.2	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
20IS43.3	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
20IS43.4	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
20IS43.5	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
Average	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Object Oriented Concepts using JAVA

Course Code	20ISE44	CIE Marks	50
Hours/Week (L: T: P)	3:2:0	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Understand the object-oriented concepts in JAVA.
CLO2	Implement the concepts of control structures
CLO3	Discuss the concepts of Inheritance, Exceptions, Packages and Interfaces
CLO4	Demonstrate the concept of Multithreading and Wrapper classes
CLO5	Interpret the need for advanced Java concepts like generics and collections in developing modular and efficient programs

Content	No. of Hours/ RBT levels
Module 1 **Introduction to Java**: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.	**10 Hours L3**
Module 2 **Classes, Inheritance, Exceptions, Packages and Interfaces**: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** inheritance basics, using super, creating multilevel hierarchy, method overriding**.** **Exception handling:** Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces.	**10 Hours L3**
Module 3 **Multi-Threaded Programming**: Multi-Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer	**10 Hours L3**

consumer problems. **Type Wrappers:** Character, Boolean, Numeric type wrappers. Autoboxing: Autoboxing and Methods, Autoboxing / Unboxing occur in expressions, Autoboxing/Unboxing Boolean and Character values, Autoboxing / Unboxing helps prevents errors.	
Module 4 **String Handling**: String Constructors, Special string operations, character extraction, Comparison, Searching and Modifying of strings, Data Conversion, Changing the case of characters, Additional String Methods, String Buffer, String Builder **Generics**: What are Generics, Simple Generics Example, A Generic Class with Two Parameters, General Form of Generic Class, Bounded Types, Wildcard Arguments, Generic Methods and Interfaces	**12 Hours** **L3**
Module 5 **The Collections Framework**: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?	**10 Hours** **L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO44.1	Illustrate the fundamentals of Java Programming.
CO44.2	Implement object-oriented concepts and exception handling in Java.
CO44.3	Apply multithreading concepts and wrapper classes in Java application development.
CO44.4	Develop Java programs to process strings using string handler methods.
CO44.5	Build applications using collection framework and generics to handle groups of objects effectively.

Textbooks:

1. **Java the Complete Reference**, Herbert Schildt, 11th Edition, Tata McGraw Hill, 2019.

Reference books:

1. **Starting Out with Java**: From Control Structures through Objects Tony Gaddis, Haywood Community College.—6th edition, Pearson Education.2017
2. **Big Java**: **Early Objects**, Cay S. Horstmann, 7th Edition, Wiley Publication.
3. **Advanced JAVA programming**, Uttam K Roy, Oxford University press, 2015.

<table>
<tr><th colspan="2">Possible list of practicals:</th></tr>
<tr><td>1</td><td>Write Java programs
a. To print Fibonacci series without using recursion and using recursion.
b. To check prime numbers.
c. To sort an array elements using bubble sort algorithm.</td></tr>
<tr><td>2</td><td>Write a Java program to create a simple rock, paper, scissors game. Here, a human is playing against the computer. Use random function to select one of the three items at both human and computer side. Scoring pattern is as below: Win: +10, Lose: -10, Tie: +5 each. The highest scorer is the winner. Play it for three trials and declare the winner after the third trial with appropriate message. If it is a tie even after the third trial, display “No Winner, No loser”. Following table describes the game rule:

<table>
<tr><th>Object 1</th><th>Object 2</th><th>Winner</th></tr>
<tr><td>Rock</td><td>Rock</td><td>No winner (Tie)</td></tr>
<tr><td>Paper</td><td>Paper</td><td>No winner (Tie)</td></tr>
<tr><td>Scissors</td><td>Scissors</td><td>No winner (Tie)</td></tr>
<tr><td>Rock</td><td>Paper</td><td>Paper</td></tr>
<tr><td>Rock</td><td>Scissors</td><td>Rock</td></tr>
<tr><td>Paper</td><td>Scissors</td><td>Scissors</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Create a class called account with the data members(Accno – integer, name String, Phone_No: integer, balance_amt:float), and following methods :
L3
Semester: IV CIE Marks 50
Course Code 20ISL48 SEE Marks 50
Hours/Week (L: T: P) 0:0:2 Duration of SEE (hours): 3
Type of Course PC Credits 1
a. getInput() to get input from the user
b. Deposit () method which takes the amount to be deposited in to his/her account and do the calculation.
c. Withdraw () method which gets the amount to be withdrawn from his/her account.
d. Print the appropriate results.</td></tr>
<tr><td>4</td><td>Write a Java Program that does the following related to Inheritance:
a. Create an abstract class called Vehicle which contains the ‘year_of_manufacture’ data member and two abstract methods ‘getData()’ and ‘putData()’ with a constructor.
b. Create two derived classes “TwoWheeler” and “FourWheeler” and implement the abstract methods. Make “FourWheeler” as final class.
c. Create class ‘MyTwoWheeler’ which is a sub-class of “TwoWheeler” and</td></tr>
</table>

	demonstrate the use of super keyword to initialize data members of “MyTwoWheeler”.
5	Write a Java Program that does the following a. Create an interface Student which gets the name and branch of a student. b. Create a package called ‘StudentPackage’ which has a user-defined class RegisterStudent. c. If a student registers above 30 credits for the semester, the method should throw a user-defined exception called ‘CreditLimit’ and display an appropriate message. d. Create another package called ‘ResultPackage’ which displays the grade for the subject registered for particular semester and the SGPA. If SGPA is above 10 then throws an Invalid SGPA user-defined exception. e. In the StudentPackage, collect the marks of all the subjects in 4 semesters and calculate SGPA and CGPA.
6	Write a Java program to implement a Bounded Buffer producer-consumer. The bounded-buffer enables concurrent access to a shared resource. A bounded buffer lets multiple producers and multiple consumers share a single buffer. Producers write data to the buffer and consumers read data from the buffer. Producers must block if the buffer is full. Consumers must block if the buffer is empty.
7	Write a Java program to implement TwoSum. Given an array of integers, return the indices of two numbers such that they add up to a specific target. You may assume that each input would have exactly one solution, and you may not use the same element twice. Example. Given numbers = [2, 7, 11, 15], target = 9 Numbers[0] + numbers[1] = 2+ 7 = 9 Return [0, 1]
8	Write Java programs for the following a. To convert an integer to Roman numerals b. To convert Roman numeral to integer. *Note: Consider the range of number to be up to 3000*
9	Write a Java program to create a linked list of names (String type). Use an Iterator to traverse through the list and print those names whose length is < 5.
10	Write a Java program to fetch and return the details (studentId, studentName) of the students who have applied for revaluation in more than one subject using a HashSet. Student class should have the private members studentid, studentName and courseid.

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying

20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20IS44.1	3	3	3	-	2	-	-	-	-	-	-	1	1	-	-	-
20IS44.2	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
20IS44.3	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
20IS44.4	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
20IS44.5	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
Average	3	3	3	-	2	-	-	-	-	-	-	1	1.8	-	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Software Engineering and Agile Methodologies

Course Code	20ISE45	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Outline software engineering principles involved in building software by following professional and ethical laws.
CLO2	To gain the knowledge of Construction or development of software project by applying phases of SDLC.
CLO3	Identify software quality parameters, schedule of project activities, estimation of time and cost.
CLO4	Recognize the need for agile practices in software development.

Content	No. of Hours/ RBT levels
Module 1 **Introduction**: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes**: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes. Requirements Elicitation and Analysis. Functional and non-functional requirements. The software Requirements Document. Requirements Specification. Requirements validation. Requirements Management.	**10 Hours L2**
Module 2 **System Models:** Context models, Interaction models, Structural models, Behavioural models, Model-driven engineering. **Design and Implementation**: Introduction to RUP, Design Principles, Object-oriented design using the UML, Design patterns, Implementation issues, Open source development.	**8 Hours L2**

Module 3 **Software Testing**: Development testing, Test-driven development, Release testing, User testing, Test Automation. **Software Evolution:** Evolution processes (Sec 9.1). Program evolution dynamics, Software maintenance, Legacy system management.	**7 Hours** **L2**
Module 4 **Project Planning**: Software pricing, Plan-driven development, Project scheduling Estimation techniques. **Quality management**: Software quality, Reviews and inspections, Software measurement and metrics, Software standards	**8 Hours** **L2**
Module 5 **Agile Software Development**: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver2.0") and Extreme Programming, Plan-driven and agile development, Agile project management, Scaling agile methods.	**7 Hours** **L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO45.1	Understand the principles of software engineering process and its phases.
CO45.2	Outline the nature of software systems based on process and system models.
CO45.3	Explain the software testing and evolution processes.
CO45.4	Demonstrate project planning process and quality management.
CO45.5	Discuss software practices in agile methodology.

Textbooks:

1. **Software Engineering**, Ian Sommerville, 9th Edition, Pearson Education, 2017. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)
2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf

Reference books:

1. Software Engineering-A Practitioners Approach, Roger S. Pressman, 7th Edition, Tata McGraw Hill.
2. An Integrated Approach to Software Engineering, Pankaj Jalote:, Wiley India

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
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Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISE45.1	3	3	3	-	-	2	2	3	1	1	-	2	2	2	-	-
20ISE45.2	3	3	3	-	1	2	2	3	1	1	-	2	2	2	-	-
20ISE45.3	3	3	2	-	1	2	2	2	1	1	-	2	2	2	-	-
20ISE45.4	3	3	2	-	-	1	1	1	1	1	2	2	2	2	-	-
20ISE45.5	3	3	3	-	2	1	1	1	1	1	1	2	2	2	-	-
Average	3	3	2.6	-	1.3	1.6	1.6	2	1	1	1.5	2	2	2	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Data Communication

Course Code	20ISE46	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites:

Course Objectives:

CLO1	Understand the basic concepts of data communication, layered model, protocols and interworking between computer networks
CLO2	Discuss the fundamentals of analog and digital transmission techniques.
CLO3	Apply various Error Detection and Correction techniques in data link layer.
CLO4	Demonstrate Link Layer services and Medium Access Control protocols for reliable and noisy channels.
CLO5	Comprehend the working of wireless and wired LANs.

Content	No. of Hours/ RBT levels
Module 1 **Data communication Fundamentals:** Introduction, components, Data Representation, Data Flow; Networks – Network criteria, Physical Structures, Network Models, Categories of networks; Protocols, Standards, Standards organization; The Internet – Brief history, Internet today; Network Models –Layered tasks; The OSI model – Layered architecture, Peer-to-Peer Process, Encapsulation; Layers in the OSI model; TCP/IP Protocol suite.	**8 Hours L2**
Module 2 **Physical Layer**: Digital Transmission Fundamentals (with problems to solve): Analog & Digital data, Analog & Digital signals (basics); Transmission Impairment – Attenuation, Distortion and Noise; Data rate limits – Nyquist Bit Rate, Shannon Capacity; Performance.	**8 Hours L3,**
Module 3 **Digital Transmission** (with problems to solve): Digital-to-Digital conversion – Line coding, Line coding schemes; Analog-to-Digital conversion - PCM. **Digital to Analog conversion**: Amplitude shift keying, Frequency shift keying, Phase shift	**8 Hours L3**

keying, quadrature amplitude modulation. **Error detection & correction** (with problems to solve): Introduction, Block coding, Linear Block codes, Cyclic codes – CRC, Polynomials, Checksum.	
Module 4 **Datalink control**: DLC services, DLL protocols, Point-to-Point Protocol – Framing, transition phases Multiple Access: Random Access (Aloha, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing), Channelization (FDMA, TDMA, CDMA)	**10 Hours** **L2**
Module 5 **Wired LANs**: IEEE standards; Standard Ethernet; **Wireless LANs**: IEEE802.11 Architecture, MAC sublayer, addressing mechanism, Bluetooth and its architecture; Connecting devices, Backbone networks.	**6 Hours** **L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO43.1	Explain the fundamentals of data communication
CO43.2	Apply analog and digital conversion techniques for data transmission
CO43.3	Demonstrate Error Detection and Correction in the transmission of data.
CO43.4	Describe the fundamentals of Data Link Control and Medium Access Control layers.
CO43.5	Outline the basics of Wired and Wireless LANs.

Textbooks:

1. **Data Communications and Networking**, Behrouz A. Forouzan, , Fifth Edition, Tata McGraw-Hill, 2017.

Reference books:

1. **Communication Networks** –Fundamental Concepts and Key architectures, Alberto Leon-Garcia and Indra Widjaja, , Second Edition, Tata McGraw-Hill, 2004.
2. **Data Communications and Networking**, Wayne Tomasi, Introduction to, Pearson Education, 2005

MOOCs

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to

50. There will be two full questions (with a maximum of four sub questions) from each modulecarrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full questionfrom each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 and added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

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CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20IS43.1	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	-
20IS43.2	3	3	3	3	-	1	-	1	-	-	-	1	-	3	-	-
20IS43.3	3	3	3	3	-	1	-	1	-	-	-	1	1	-	-	3
20IS43.4	3	3	3	3	-	1	-	1	-	-	-	1	1	3	-	-
20IS43.5	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	1
Average	3	3	3	3	-	1	-	1	-	-	-	1	3	3	-	2

Low-1: Medium-2: High-3

SEMESTER -IV

COURSE: Design and Analysis of Algorithms Laboratory

Subject Code	20ISEL47	CIE Marks	50
Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Examination Hours	03

Course Objectives:

CLO1	Understand asymptotic performance of algorithms.
CLO2	Apply appropriate linear and non linear data structures to enhance the performance of Algorithms
CLO3	Implement sorting, searching algorithms and analyze its performance
CLO4	Design and implement different techniques and strategies to solve real world problems
CLO5	Critically analyze the efficiency of alternative algorithmic solutions for the same problem

Sl. No.	Experiments	No. of Hours/ RBT levels
	Part- A	
1	Sort a given set of ***n*** integer elements using **Selection Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.	**L3**
2	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a FILE or can be generated using the random number generator. Demonstrate using C how divide-and-conquer method works along with its time complexity analysis:	**L3**

	worst case, average case and best case.	
3	Implement in C, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.	**L3**
4	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in C	**L3**
5	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal's algorithm.** Use Union-Find algorithms in your program	**L3**
6	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**.	**L3**
7	Write C programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.	**L3**
8	Design and implement in C to find a **subset** of a given set **S** = {Sl, S2,.....,Sn} of ***n*** Positive integers whose SUM is equal to a given positive integer ***d***. For example, if S = {1, 2, 5, 6, 8} and ***d***= 9, there are two solutions {1, 2, 6} and {1, 8}. Display a suitable Message, if the given problem instance doesn't have a solution.	**L3**
9	Design and implement in C ,the Hamiltonian problem and analyses for NP Completeness.	**L3**

Note: Division into Part A and B is not mandatory. Depending on the nature of laboratory, BoS can decide whether to split or not.

Course Outcomes: Upon successful completion of this course, student will be able to:

CO47L.1	Implement sorting algorithms and analyze its performance
CO47L.2	Write algorithms using appropriate design techniques such as greedy and dynamic programming
CO47L.3	Implement algorithms for directed and undirected graphs
CO47L.4	Design and implement algorithm using branch and bound, and back tracking
CO47L.5	Design and implement algorithm using NP Completeness

Textbooks:

1**. Introduction to the Design and Analysis of Algorithms**, Anany Levitin:, 2rd Edition, 2019. Pearson.

2. **Computer Algorithms/C++,** Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press

References book:

1. **Introduction to Algorithms**, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.

2.**Design and Analysis of Algorithms** , S. Sridhar, Oxford (Higher Education)

Scheme of Examination:

Semester End Examination (SEE):

SEE for the practical courses will be based on experiment conduction with proper results, and is evaluated for 50 marks that include 40 marks for conduction and Viva is for 10 marks

Total SEE for laboratory is 50 marks.

Continuous Internal Evaluation (CIE):

The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The Average Marks (AM) over number of weeks is considered for 30 marks. At the end of the semester a Test (T) is conducted for 20 marks.

Total CIE for laboratory is 50 marks.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISL47.1	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISL47.2	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISL47.3	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
20ISL47.4	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
Average	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER -IV

COURSE: Microprocessor Microcontroller Laboratory

Subject Code	20ISEL48	CIE Marks	50
Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Examination Hours	03

Course Objectives:

CLO1	To understand Assembly Language programs using 8086
CLO2	To understand Assembly Language programs using 8051
CLO3	To interface simple peripheral devices to 8086 microprocessor.

Sl. No.	Experiments	No. of Hours/ RBT levels
	Part- A	
1	Write an ALP using 8086 to Search a key element in a list of 'n' 16-bit number using the Binary search algorithm.	**L3**
2	Write an ALP using 8086 to Sort a given set of 'n' numbers in ascending order using the Bubble Sort algorithm.	**L3**
3	Write an ALP using 8086 to Compute nCr using recursive procedure. Assume that 'n' and 'r' are non-negative integers.	**L3**
4	Write an ALP using 8086 to Read an alphanumeric character and display its equivalent ASCII code at the center of the screen.	**L3**
5	Write an assembly language program to find Arithmetic operations using 8051	**L3**
6	Write an assembly language program to find the largest number from a series using 8051	**L3**
7	Write an assembly language program to find the square and square root of a number using 8051	**L3**
8	Write an assembly language program to find the sum of n numbers using 8051	**L3**
	Part-B	
9	Write an ALP using 8086 to Read the status of eight input bits from the Logic Controller Interface and display 'FF' if it is the parity of the input read is even;	**L3**

	otherwise display 00.	
10	Write an ALP using 8086 to Implement a BCD Up-Down Counter on the Logic Controller Interface.	**L3**
11	Write an ALP using 8086 to Display messages FIRE and HELP alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages.	**L3**
12	Write an ALP using 8086 to Drive a Stepper Motor interface to rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).	**L3**
13	Write an ALP using 8086 to Scan a 8 x 3 keypad for key closure and to store the code of the key pressed in a memory location or display on screen. Also display row and column numbers of the key pressed.	**L3**
14	Write an ALP using 8086 to Drive an elevator interface in the following way i. Initially the elevator should be in the ground floor, with all requests in OFF state. ii. When a request is made from a floor, the elevator should move to that floor, wait there for a couple of seconds (approximately), and then come down to ground floor and stop. If some requests occur during going up or coming down they should be ignored.	**L3**
15	Write an ALP using 8086 to Generate the Sine Wave using DAC interface.	**L3**
16	Write an ALP using 8086 to Generate a Fully Rectified Sine waveform using the DAC interface.	**L3**

Note: Division into Part A and B is not mandatory. Depending on the nature of laboratory, BoS can decide whether to split or not.

Course Outcomes: Upon successful completion of this course, student will be able to:

CO1	1. Demonstrate assembly language programming proficiency using addressing modes and data transfer instructions, memory arrays, and DOS functions of 8086.
CO2	2. Demonstrate assembly language programming proficiency using the instruction set of 8051
CO3	3. Apply the interfacing concepts to connect a peripheral device like keypad, stepper motor, logic controller, DAC and 7-segment display with 8086

Text Books:

4. Barry B. Brey, "THE INTEL Microprocessors-Architecture, Programming and Interfacing", 8thEdition, Pearson, 2012.(Units I-IV)
5. A.K.Ray and K.M. Bhurchandi, "Advanced Microprocessor and Peripherals" Tata McGraw Hill, 3rdEdition, 2013(Unit-5)

6. Muhammed Ali Mazidi, Janice GillispleMaidi, Rolin.D. McKinlay, “The 8051 Microcontroller and Embedded Systems, Using Assembly and C”, Second edition, Pearson Prentice Hall, 2015.

Reference Books:

1. N.Senthilkumar, M.Saravanan, S,Jeevanathan, “Microprocessors and Microcontrollers”, Oxford University Press, 2011
2. Kenneth J Ayala, “The 8086 Microprocessor: Programming and Interfacing the PC”, Cengage Learning, Reprint 2014
4. Kenneth J Ayala, “The 8051 Microcontroller”, 3rd edition, Cengage Learning, Reprint 2014..

Scheme of Examination:

Semester End Examination (SEE):

SEE for the practical courses will be based on experiment conduction with proper results, and is evaluated for 50 marks that include 40 marks for conduction and Viva is for 10 marks

Total SEE for laboratory is 50 marks.

Continuous Internal Evaluation (CIE):

The Laboratory session is held every week as per the timetable and the performance of the student is evaluated in every session. The Average Marks (AM) over number of weeks is considered for 30 marks. At the end of the semester a Test (T) is conducted for 20 marks.

Total CIE for laboratory is 50 marks.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
20ISL48.1	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
20ISL48.2	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
20ISL48.3	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
20ISL48.4	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
20ISL48.5	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-
Average	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-

Low-1: Medium-2: High

SEMESTER – III/IV

Course: Universal Human Values and Ethics

Course Code	NCMC 4	CIE Marks	100
Hours/Week (L: T: P)	2:0:0	SEE Marks	-
No. of Credits	0	Examination Hours	-

Course Objectives:

CLO1	To create an awareness on Engineering Ethics and Human Values.
CLO2	To understand social responsibility of an engineer.
CLO3	To appreciate ethical dilemma while discharging duties in professional life.

Content	No. of Hours
Module 1 **Introduction to Value Education** • Value Education, Definition, Concept and Need for Value Education. • The Content and Process of Value Education. • Basic Guidelines for Value Education. • Self-exploration as a means of Value Education. • Happiness and Prosperity as parts of Value Education.	**05 Hours**
Module 2 **Harmony in the Human Being** • Human Being is more than just the Body. • Harmony of the Self ('I') with the Body. • Understanding Myself as Co-existence of the Self and the Body. • Understanding Needs of the Self and the needs of the Body. • Understanding the activities in the Self and the activities in the Body.	**05 Hours**
Module 3 **Harmony in the Family and Society and Harmony in the Nature** • Family as a basic unit of Human Interaction and Values in Relationships. • The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love. • Comprehensive Human Goal: The Five Dimensions of Human Endeavour. • Harmony in Nature: The Four Orders in Nature. • The Holistic Perception of Harmony in Existence	**05 Hours**

Module 4	05 Hours
Social Ethics • The Basics for Ethical Human Conduct. • Defects in Ethical Human Conduct. • Holistic Alternative and Universal Order. • Universal Human Order and Ethical Conduct. • Human Rights violation and Social Disparities.	
Module 5	**05 Hours**
Professional Ethics • Value based Life and Profession. • Professional Ethics and Right Understanding. • Competence in Professional Ethics. • Issues in Professional Ethics – The Current Scenario. • Vision for Holistic Technologies, Production System and Management Models.	

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the role of a human being in ensuring harmony in society and nature.
CO4	Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.

TEXTBOOKS:

1.A.N Tripathy, New Age International Publishers, 2003.
2.Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004
3.Bertrand Russell Human Society in Ethics & Politics

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Corliss Lamont, Philosophy of Humanism.
4. Gaur. R.R. , Sangal. R, Bagari G.P, A Foundation Course in Value Education, Excel Books, 2009.
5. Gaur. R.R. , Sangal R , Bagaria G.P, Teachers Manual, Excel Books, 2009.
6. I.C. Sharma, Ethical Philosophy of India, Nagin & co, Julundhar
7. William Lilly- Introduction to Ethics -Allied Publisher

Scheme of Examination:

There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 1.

Table 1: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**