



# Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

## Bachelor of Technology

in

## Electronics and Computer Science

## Second Year Scheme & Syllabus

(As per AICTE guidelines, with effect from the Academic Year 2022-23)

## Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. Autonomy curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice Based Credit and Grading System (CBCGS)**. The number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the Programme. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by third year of the engineering Programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of Programme, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learners capable to work in industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Wellness – Body, Mind & Spirit, Indian Traditional Knowledge system under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 15 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability, and entrepreneurship.

Chairman, Board of Studies  
Department of Electronics and Computer Science  
Vidyalankar Institute of Technology

Chairman, Academic Council  
Vidyalankar Institute of Technology

**Second Year B. Tech. Electronics and Computer Science**  
**Course Structure and Assessment Guidelines**

**Semester: III**

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS03	Technical and Business Writing	Theory + Practical	2	75	-	-	075
BS06	Engineering Mathematics-III	Theory	3	20	30	50	100
EC01T	Electronic Devices and Circuits	Theory	2	15	20	40	075
EC01P	Electronic Devices and Circuits Lab	Practical	1	25	-	25	050
EC02T	Electrical Circuit Analysis	Theory	2	15	20	40	075
EC02P	Electrical Circuit Analysis Lab	Practical	1	25	-	25	050
EC03T	Data Structure	Theory	2	15	20	40	075
EC03P	Data Structure Lab	Practical	1	25	-	25	050
EC09T	Python Programming	Theory	2	15	20	40	075
EC09P	Python Programming Lab	Practical	1	25	-	25	050
GEXXX*	Any GE course	As per course					

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination

\*Selection based on the subset of GE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

**Second Year B. Tech. Electronics and Computer Science**  
**Course Structure and Assessment Guidelines**

**Semester: IV**

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS06	Principles of Economics and Management	Theory + Tutorial	3	20	30	50	100
BS08	Engineering Mathematics-IV	Theory	3	20	30	50	100
EC04T	Computer Organization & Architecture	Theory	2	15	20	40	075
EC04P	Computer Organization & Architecture Lab	Practical	1	25	-	25	050
EC05T	Control Systems Engineering	Theory	2	15	20	40	075
EC05P	Control Systems Engineering Lab	Practical	1	25	-	25	050
EC06T	Signals and Systems	Theory	2	15	20	40	075
EC06P	Signals and Systems Lab	Practical	1	25	-	25	050
EC07T	Web Technology	Theory	2	15	20	40	075
EC07P	Web Technology Lab	Practical	1	25	-	25	050
EC08T	Database Management System	Theory	2	15	20	40	075
EC08P	Database Management System Lab	Practical	1	25	-	25	050

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

## Detailed Syllabus of Second Year Semester - III

**Course Name:** Technical and Business Writing

**Course Code:** HS03

**Category:** Humanities, Social Sciences and Management

**Preamble:**

The course, Technical and Business Writing, introduces students to the basics of effective writing, one of the core pillars of communication skills. Technical writing is a significant aspect of the engineering curriculum and engineers will encounter a plethora of technical writing tasks in their careers, wherein their writing needs to be professional. Technical and Business Writing will enable students to draft effective emails and letters, technical proposals and reports, maintain meeting documentation, while actively using contemporary digital writing tools.

**Pre-requisites:**

NIL

**Course Objectives:**

- To enable learners to gain understanding of writing effective letters, proposals and reports.
- To facilitate learners in developing the skills of participating in meetings.
- To create awareness of strengthening research orientation by reading and paraphrasing technical papers.
- To introduce strategies for drafting documentation required for higher studies.

**Course Outcome:**

Learner will be able to:

CO1: Draft effective letters and emails for various professional and business requirements.

CO2: Collect and compile data in the form of a technical report, and present findings in front of an audience.

CO3: Write technical reviews and instructions and differentiate between various hazard notations.

CO4: Draft persuasive proposals to achieve the desired outcomes.

CO5: Participate in meetings and draft meeting-related documentation like notice, agenda and minutes.

CO6: Write a Statement of Purpose and understand the requirements of a Letter of Recommendation.

**Course Scheme:**

Contact Hours		Credits Assigned
Theory	Practical	Theory + Practical
1	2	2

**Assessment guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	-	075
Practical	50	-	-	

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

<b>Module No.</b>	<b>Module Name</b>	<b>Content</b>	<b>No. of Hours</b>
1	Business Correspondence	Principles of Correspondence (7 Cs) Parts of a letter and Formats Request for information/permission Enquiry, Reply to Enquiry Letters Complaints, Claims, Adjustment Letters Email writing and etiquette	4
2	Report Writing	Significance, Objectives of Report Writing Types of Reports Language and Style of Reports Formats of Reports Synopsis writing	3
3	Technical Writing	Introduction to Technical Writing Writing Definitions, Instructions, Safety Notations, Descriptions Technical Reviews of gadgets, software and technologies Principles of Scientific Vocabulary Technical Reports & Technical Presentation Paraphrasing Technical Paper (IEEE Format)	3
4	Proposal Writing	Parts of a Proposal and Formats Drafting persuasive proposals	2
5	Meetings and Documentation	Strategies for conducting effective meetings (in person/virtual) Note Taking Notice, Agenda, and Minutes of Meeting Business Meeting Etiquettes	2
6	Documentation for Higher Studies	Statement of Purpose Letter of Recommendation	1
<b>Total</b>			<b>15</b>

**Suggested List of Assignments:**

- Draft an email and a reply to that on any one type of letter (Individual)
- Draft a synopsis of the mini-project report (Group)
- Paraphrase a published IEEE Technical Paper (Individual)
- Draft a technical proposal (Group)
- Participate in a mock meeting and prepare notice, agenda, and minutes (Group)
- Draft a Statement of Purpose (for admission to Higher Studies) (Individual)

**Suggested List of Practical:**

1. Ice Breakers/Elevator Pitch
2. Letter Writing & Email Writing
3. Synopsis Writing
4. Paraphrase a published IEEE Technical Paper
5. Technical Proposal – Discussion and drafting with relevance to domain (application-based)
6. Mock Meeting (Oral + Documentation)
7. Technical Blogs
8. Technical Reviews
9. Drafting Statement of Purpose & LOR
10. Mini Project Presentation

**Guidelines to conduct mini project:**

1. The Laboratory work is to be conducted by a group of three-five students.
2. To encourage project-based learning in the curriculum students may either select one of the mini project topics from the list given or a topic of their choice after a review process by the subject faculty.
3. Each group along with subject faculty shall identify a potential area of mini project selected, on which the study can be conducted. They can perform the survey-based analysis related to the topic selected.
4. Students should prepare presentation and present their findings on the selected topics.
5. Project assessment will be done at the end of the semester.

**Suggested Online Courses:**

1. Courses on Communication offered by Udemy, Coursera, EdX, NPTEL Swayam, TCS iON
2. Writing Skills for Engineering Leaders <https://www.coursera.org/programs/vidyalankar-institute-of-technology-coursera-response-program-tysb7/browse?productId=6sk543Q6EeaRqAobOpNSMQ&productType=course&query=technical+and+business+writing&showMiniModal=true>
3. Technical Writing <https://www.coursera.org/programs/vidyalankar-institute-of-technology-coursera-response-program-tysb7/browse?productId=4ESRQQpFEea5dwol2CF9Kw&productType=course&query=technical+writing&showMiniModal=true>

**Reference Books:**

1. Raman Meenakshi and Sangeeta Raman, "Communication Skills", OUP, 2016.



2. Murphy Herta, "Effective Business Communication", McGraw Hill, 2017.
3. Locker Kitty, "Business Communication-Building Critical Skills", McGraw Hill, 2013.
4. Lehman Dufrene, Sinha, "BCOM", Cengage Learning, 2020.
5. Stanton Nicky, "Mastering Communication", Palgrave Master Series, 2009.
6. A. Kaul, "Effective Business Communication", Prentice Hall of India, 2015.
7. Monipally, "Business Communication Strategies", Tata McGraw Hill, 2001.
8. Monipally, "The Craft of Business Letter Writing", Tata McGraw Hill, 1997.
9. Lesiker and Petit, "Report Writing for Business", Mc Graw Hill, 1997.
10. R.C. Sharma and Krishna Mohan, "Business Correspondence and Report Writing", Mc Graw Hill, 2017.

**Course Name:** Engineering Mathematics-III

**Course Code:** BS06

**Category:** Basic Science

**Preamble:**

The objective of the course is to impart the knowledge of Laplace Transform, Z-Transform, Fourier Series, Fourier Transforms and Complex Variable. The course clarifies the concept of transforms and its applications. The course will enable students to learn different transforms of a function, Complex Variable and it will provide with a sound foundation in Mathematics to prepare them for graduate studies in Electronics and Computer Science Engineering.

**Pre-requisites:**

Engineering Mathematics-I, II and Basic Mathematics of XI and XII std.

**Course Objectives:**

- To understand and apply Laplace and inverse Laplace transform to solve differential equations.
- Understanding the fundamentals of Fourier series, Fourier transform, Z-transform, and Complex Variable to solve real world problems.
- To create a strong foundation by studying the basics of Engineering Mathematics and interfacing to various peripherals which will lead to a well-designed based System.
- To provide students with the sound foundation of Mathematics, Science, and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and prepare them for Graduate studies.
- To impart knowledge of interfacing techniques and educate the student in the domain of Electronics and Computer Science Engineering.

**Course Outcomes:**

Student will be able to:

- CO1. Apply the knowledge of Laplace Transform to find Laplace Transform of a given function and to solve real integrals in engineering problems.
- CO2. Apply the knowledge of Inverse Laplace Transform to find Inverse Transform of a given function.
- CO3. Find Fourier series of a given periodic functions by decomposing it into sine and cosine series.
- CO4. Apply the knowledge to find Fourier Transform for real life problems and complex engineering problems.
- CO5. Apply the knowledge to find Z-Transform of a given sequence.
- CO6. Apply the concept of Complex Variable to Engineering problems.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Tutorial
3	0	3	0

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Laplace Transform	Definition of Laplace transform Laplace Transform (L) of Standard Functions, Properties of Laplace Transform: Linearity, First Shifting theorem, Second Shifting Theorem, change of scale Property, Multiplication by t, Division by t, Laplace Transform of derivatives and integrals (All Properties are without proofs). Evaluation of integral using Laplace Transform.	8
2	Inverse Laplace Transform	Formulae of Inverse Laplace Transform, Laplace Inverse using partial fraction, Properties of Inverse Laplace Transform, convolution Theorem (without proof).	8
3	Fourier Series	Fourier series of a periodic function in the interval of period $2\pi$ , $2L$ . Half range Sine and Cosine Fourier series, Complex form of Fourier series.	8
4	Fourier Transform	Fourier Transform, Fourier Sine & Cosine Transform. Inverse Fourier transforms.	8
5	Z-Transform	Z-Transform of a sequence, properties (without proof), examples based on properties. Inverse Z-Transform, Binomial method, convolution theorem (without proof).	6
6	Complex Variable	Analytic function, C-R equations in polar & cartesian form (without proof), Harmonic function. Finding analytic function if $u$ or $v$ or $(u + v)$ or $(u - v)$ is given, Milne-Thompson method, Orthogonal trajectories.	7
<b>Total</b>			<b>45</b>

**Textbooks:**

1. Dr. B V Ramana "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, India 2006
2. P N Wartikar and J N Wartikar "*Textbook of Applied Mathematics Volume I & II, Vidyarthi Ghriha* Prakashan Pune 2005 9<sup>th</sup> Edition.
3. Kanti B Datta, "Mathematical methods for Science and Engineering", Cengage learning 2012.
4. N P Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publication 2006.

**Reference Books:**

1. Dr. B S Grewal, "Higher Engineering Mathematics", Khanna Publication, 44<sup>th</sup> Edition.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & sons, 10<sup>th</sup> Edition.
3. C. R. Wylie & L. C. Barrett, "Advanced Engineering Mathematics", Tata McGraw India, 6<sup>th</sup> Edition.
4. H K Das, "Advanced Engineering Mathematics", S Chand, 22<sup>nd</sup> Edition.
5. Murray R. Spiegel. "Schaum's Outline of Laplace Transform", Tata McGraw India, 1<sup>st</sup> Edition.
6. Murray R. Spiegel. "Schaum's Outline of Fourier analysis with applications", Tata McGraw India ,1<sup>st</sup>Edition.
7. Robert Vich, "Z transform theory and its applications", Springer, 10<sup>th</sup> Edition.
8. Dr. B S Tyagi, "Function of a Complex variable", Kedar Nath & Ram Nath publication, 2021.

**Course Name:** Electronics Devices & Circuits

**Course Code:** EC01T

**Category:** Core

**Preamble:**

Electronic Devices and Circuits is a fascinating subject that delves into the design, analysis, and applications of electronic devices and circuits. This subject is critical to the field of electronics engineering, as it provides a fundamental understanding of the behavior of electronic devices and their interaction with circuits. In this subject, students will learn about a wide range of electronic devices such as diodes, transistors, operational amplifiers, Filters, Oscillators, and timers. Electronic Devices and Circuits is a crucial subject for any student who wants to pursue a career in electronics engineering. It lays the foundation for understanding advanced topics such as microelectronics, integrated circuit design, and electronic system design. Throughout this course, students will be challenged to think critically, solve problems, and apply their knowledge to real-world applications. With a strong grasp of the concepts covered in this subject, students will be well-prepared to tackle the challenges of the rapidly evolving field of electronics engineering.

**Pre-requisites:**

1. Understanding of mathematics, including algebra, calculus, and trigonometry.
2. Knowledge of physics, including electricity and magnetism.
3. Understanding of electronic components such as resistors, capacitors, and inductors.
4. Knowledge of circuit analysis techniques such as Kirchoff's laws, Ohm's law, and nodal and mesh analysis.

**Course Objectives:**

- To deliver the knowledge about physics of basic semiconductor devices and circuits.
- To enhance comprehension capabilities of students through understanding of electronic devices and circuits
- To introduce and motivate students to the use of advanced microelectronic devices.
- To analyze and design electronic circuits using semiconductor devices.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Demonstrate an understanding of the fundamentals of discrete and integrated circuits.

CO2: Analyze MOSFET and BJT based amplifiers using AC, DC, and frequency analysis.

CO3: Understanding the need and applications of Operational Amplifiers in electronic circuits.

CO4: Apply the concepts of feedback while designing Operational amplifiers and Oscillator circuits.

CO5: Designing timer circuits for various applications.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Unit No.	Contents	No. of Hours
1		<b>Introduction to BJT and MOSFET</b>	06
	1.1	Introduction to BJT, Configurations of BJT, Input and Output characteristics of BJT in CE configuration.	
	1.2	DC Analysis: Concept of DC load line, Q point and regions of operations, Analysis of Voltage Divider Biasing Circuits in CE configuration	
	1.3	MOSFET-Construction and working, Characteristics of MOSFET-Transfer and Drain Characteristics, Regions of Operation	
	1.4	DC Analysis of different Biasing Circuits	
2		<b>AC Analysis and Frequency Response of MOSFET Amplifiers</b>	06
	2.1	AC analysis: Small Signal AC model of MOSFET, Small signal analysis: Input impedance, output impedance, voltage gain for voltage divider circuit.	
	2.2	Frequency Analysis: Effects of coupling, bypass, and parasitic capacitors on frequency response of single stage amplifier, Miller effect and Miller capacitance.	
	2.3	Low frequency and high frequency analysis of CS (E-MOSFET) amplifier.	
3		<b>Introduction to Op-Amp</b>	06
	3.1	Introduction and concept of Differential amplifier. Block diagram of Op-Amp. Ideal and practical characteristics of Op-Amp. Op-Amp Parameters.	
	3.2	Configurations of Op-Amp: Open loop and closed loop, Inverting and Non-inverting Op-Amp and buffer.	
	3.3	Summing amplifier, difference amplifiers and Instrumentation amplifiers using Op-Amp.	
4		<b>Linear Applications of Operational Amplifier</b>	06
	4.1	Voltage to current (V-I) and current to voltage (I-V) converter	
	4.2	Integrator & Differentiator (Ideal & practical)	
	4.3	Active Filters: First and Second order active, low pass, high pass, band pass, band reject and Notch filters (Second order Derivation is not expected)	
	4.4	Concept to Positive and Negative feedback, Barkhausen's criteria for sustained oscillations. Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator.	

Module No.	Unit No.	Contents	No. of Hours
5		<b>Non-Linear Integrated Circuits</b>	06
	5.1	Comparators: Inverting comparator, non-inverting comparator, zero crossing detectors, window detector.	
	5.2	Schmitt Triggers: Inverting Schmitt trigger, non-inverting Schmitt trigger	
	5.3	IC 555 Timer: Astable, Monostable, Bistable Multivibrator.	
<b>Total</b>			<b>30</b>

**Text Books:**

1. Donald A. Neamen, Electronic Circuit Analysis and Design, TATA McGraw Hill, 2nd Edition
2. Adel S Sedra, Kenneth C. Smith and Arun N Chandorkar, Microelectronic Circuits Theory and Applications||, International Version, OXFORD International Students Edition, Fifth Edition.
3. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.
4. Ramakant A. Gayakwad, "*Op-Amps and Linear Integrated Circuits*", Pearson Prentice Hall, 4th Edition.

**Reference Books:**

1. Boylestad, " Electronic Devices and Circuit Theory", Pearson
2. David A. Bell, Electronic Devices and Circuits||, Oxford, Fifth Edition.
3. Muhammad H. Rashid, Microelectronics Circuits Analysis and Design, Cengage
4. S. Salivahanan, N. Suresh Kumar, —Electronic Devices and Circuits||, Tata McGraw Hill
5. Millman and Halkies, —Integrated Electronics||, TATA McGraw Hill.
6. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition

**Course Name:** Electronics Devices & Circuits Lab

**Course Code:** EC01P

**Category:** Core

**Preamble:**

The Lab of Electronic Devices and Circuits is an essential component of the Electronic Devices and Circuits course. It provides students with hands-on experience in designing, building, and testing electronic circuits using a variety of electronic devices. Through this lab, students will learn how to use electronic components such as diodes, transistors, operational amplifiers, and digital logic gates to create circuits that perform specific functions. They will also gain experience in using test equipment such as oscilloscopes, function generators, and multimeters to measure circuit performance. The Lab of Electronic Devices and Circuits is an excellent opportunity for students to apply the concepts they have learned in the classroom to real-world situations. They will be challenged to think critically, solve problems, and troubleshoot issues that arise during circuit design and testing. By the end of this lab, students will have gained valuable skills in electronic circuit design, prototyping, and testing. These skills will be essential for their future careers in electronics engineering, where hands-on experience is highly valued. It is important to note that safety is a critical component of the Lab of Electronic Devices and Circuits, and students will be required to follow all safety protocols and guidelines to ensure their safety and the safety of those around them.

**Pre-requisites:**

1. Understanding of mathematics, including algebra, calculus, and trigonometry.
2. Knowledge of physics, including electricity and magnetism.
3. Understanding of electronic components such as resistors, capacitors, and inductors.
4. Knowledge of circuit analysis techniques such as Kirchhoff's laws, Ohm's law, and nodal and mesh analysis.

**Course Objectives:**

- To deliver the knowledge about physics of basic semiconductor devices and circuits.
- To enhance comprehension capabilities of students through understanding of electronic devices and circuits
- To introduce and motivate students to the use of advanced microelectronic devices.
- To analyze and design electronic circuits using semiconductor devices.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Demonstrate an understanding of the fundamentals of discrete and integrated circuits.

CO2: Analyze MOSFET and BJT based amplifiers using AC, DC, and frequency analysis.

CO3: Understanding the need and applications of Operational Amplifiers in electronic circuits.

CO4: Apply the concepts of feedback while designing Operational amplifiers and Oscillator circuits.

CO5: Designing timer circuits for various applications.



**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	02	-	01

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested list of Practicals:**

Sr. No.	Experiment Title
1	Use of online tools and simulators for electronic devices and circuits
2	Input and Output Characteristics of BJT
3	Transfer and Drain Characteristics of Enhancement Type MOSFET
4	MOSFET Biasing circuits
5	Frequency response of Single stage MOSFET amplifier (CS)
6	Voltage series negative feedback Circuit
7	RC oscillators: Phase Shift Oscillators
8	RC oscillators: Wien Bridge Oscillators
9	LC Oscillators: Hartley and Colpitts Oscillators
10	Inverting, non-inverting, summing, difference amplifiers using Op-Amp (IC 741)
11	Schmitt Trigger using (IC 741)
12	IC 555 Timer: Astable, Monostable Multivibrator

**Text Books:**

1. Donald A. Neamen, Electronic Circuit Analysis and Design, TATA McGraw Hill, 2nd Edition
2. Adel S Sedra, Kenneth C. Smith and Arun N Chandorkar, Microelectronic Circuits Theory and Applications, International Version, OXFORD International Students Edition, Fifth Edition.
3. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.
4. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4th Edition.

**Reference Books:**

1. Boylestad," Electronic Devices and Circuit Theory", Pearson
2. David A. Bell, Electronic Devices and Circuits||, Oxford, Fifth Edition.
3. Muhammad H. Rashid, Microelectronics Circuits Analysis and Design, Cengage
4. S. Salivahanan, N. Suresh Kumar, —Electronic Devices and Circuits||, Tata McGraw Hill
5. Millman and Halkies, —Integrated Electronics||, TATA McGraw Hill.
6. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University
7. Press, Indian Edition

**Course Name:** Electrical Circuit Analysis

**Course Code:** EC02T

**Category:** Core

**Preamble**

Understanding how circuits work and being able to analyze their behavior is essential for engineers and technicians in many fields, including electronics, telecommunications, power generation and distribution, and control systems. In this subject, we will explore the fundamental principles of electrical circuits and their components, such as resistors, capacitors, and inductors, and learn how to apply techniques such as Kirchhoff's laws, Ohm's law, and circuit analysis methods to analyze circuit behavior and solve problems. We will also study advanced topics such as Transient analysis, Laplace transform, two-port networks, and network functions. By the end of this course, the learner will have gained a deep understanding of electrical networks and be able to analyze and design networks for a variety of practical applications.

**Pre-requisites:**

Engineering Mathematics I & II,  
Digital Electronics

**Course Objectives:**

- To understand Magnetic and Electrical Circuits
- To evaluate Network parameters of given Electrical network
- To understand the working of Single-Phase Transformers

**Course Outcomes:**

Learner will be able to:

CO1: Students will be able to apply their understanding of network theorems in analyzing complex DC circuits.

CO2: Students will be able to understand j-domain conversion & analysis of simple AC circuits.

CO3: Students will be able to understand various factors of magnetically coupled circuit and its analysis.

CO4: Students will be able to understand time domain response of electrical circuits and thereby understand the behavior of electrical networks.

CO5: Students will be able to evaluate various network parameters of network and thereby understand inter relationship between parameters.

CO6: Students will be able to understand types & illustrate the working of single-phase transformer.

Programme Scheme & Syllabus (R-2022) for Second Year Bachelor of Technology (B.Tech.)  
Electronics and Computer Science

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	DC Circuits	Basics of Circuit Analysis, Kirchhoff's Laws, Voltage and current Sources, Source Transformation, Mesh and Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem	7
2	AC circuits (Steady State Analysis)	Conversion of L & C in j-domain form, Analysis of single-phase AC circuit using Mesh & Node Analysis, Superposition, Thevenin's, Norton's & Maximum Power Transfer Theorems	5
3	Magnetically Coupled Circuits	Magnetic Circuits, Self and Mutual inductances, dot convention, transformation and coupled circuits, coefficient of coupling, Analysis of coupled Circuit using Loop Analysis.	3
4	Time Domain & Frequency Domain Analysis	Introduction to Transient State & Steady state, Initial & Final conditions, Transient and Steady state analysis of RC, RL and RLC Circuits using standard equations. Introduction to Laplace Transform, Representation of time domain parameters in frequency domain, Analysis of circuit using Laplace transform.	5
5	Two Port Network	Network Functions of one port and two port Network, Two port network parameters, Z, Y, ABCD, h and g parameters, Inter-relationship between parameters.	6
6	Single Phase Transformer	Construction, Type of Transformer, Working principle of single-phase transformer classification of Transformer • EMF equation of a transformer • Applications of Transformers	4
<b>Total</b>			<b>30</b>

**Text Books:**

1. Ravish Singh "Electrical Network Analysis and Synthesis Tata McGraw Hill, (Revised Second Edition)  
V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2. B.L.Theraja "Electrical Engineering " Vol-I and II. 2. S.N.Singh, "Basic Electrical Engineering" PHI ,  
2011Book
3. Network Analysis, M. E. Van Valkenburg/T.S. Rathore, Pearson Education, 3rd Edition (2019).
4. Circuits and Networks: Analysis and Synthesis, A. Sudhakar and S.P. Shyammohan McGraw Hill  
Education (India) Private Limited; 5th edition (2015).

**Reference Books:**

1. Circuit Theory Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., Seventh - Revised edition  
(2018)
2. MahmoodNahvi and Joseph A. Edminister, "Schaum's Outline of Electrical Circuits", McGraw-Hill  
Education, 7 th Edition (2017).
3. Problems and Solutions of Electrical Circuit Analysis, R.K. Mehta & A.K. Mal, CBS Publishers and  
Distributors Pvt Ltd (2015).
4. Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011
5. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
6. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition  
2011.
7. M. Naidu, S. Kamakshaiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004

**Course Name:** Electrical Circuit Analysis lab

**Course Code:** EC02P

**Category:** Core

**Preamble**

Understanding how circuits work and being able to analyze their behavior is essential for engineers and technicians in many fields, including electronics, telecommunications, power generation and distribution, and control systems. In this subject, we will explore the fundamental principles of electrical circuits and their components, such as resistors, capacitors, and inductors, and learn how to apply techniques such as Kirchhoff's laws, Ohm's law, and circuit analysis methods to analyze circuit behavior and solve problems. We will also study advanced topics such as Transient analysis, Laplace transform, two-port networks, and network functions. By the end of this course, the learner will have gained a deep understanding of electrical networks and be able to analyze and design networks for a variety of practical applications.

**Pre-requisites:**

Engineering Mathematics I & II

Digital Electronics

**Course Objectives:**

- To understand Magnetic and Electrical Circuits
- To evaluate Network parameters of given Electrical network
- To understand the working of Single-Phase Transformers

**Course Outcomes:**

Learner will be able to:

CO1: Students will be able to apply their understanding of network theorems in analyzing complex DC circuits.

CO2: Students will be able to understand the behaviour of electrical networks.

CO3: Students will be able to evaluate various network parameters of network

CO4: Students will be able to understand types & illustrate the working of single-phase transformer.

**ISA:**

At least 10 experiments covering entire syllabus of Electrical Circuit and Analysis should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. Practical and Oral exam will be based on the entire syllabus.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested List of Experiments**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. To measure output voltage across load resistor/current through load resistor and verify the result using Mesh and Nodal analysis.
3. Verification of Superposition Theorem.
4. Verification of Thevenin’s Theorem.
5. Verification Norton’s Theorem.
6. Verification Maximum Power Transfer Theorem.
7. Verification of Two port Network Parameters
8. To find resonance conditions in a R-L-C series resonance circuit
9. To demonstrate cut-out sections of single-phase transformer and verify its Voltage ratio.
10. Problem based learning Experiment

**Simulation Experiments**

1. Verification of Theorems on Multisim
2. Study of Step Up and Step-Down Transformers of Tinkercad
3. Transient Responses of Series RLC, RL, And RC Circuits with Sine and Step Inputs using MATLAB Simulink
4. Understanding Series and parallel resonance using LT spice /Multisim

**Text Books:**

1. Ravish Singh “Electrical Network Analysis and Synthesis Tata McGraw Hill, (Revised Second Edition)  
V. N. Mittal and Arvind Mittal “Basic Electrical Engineering” Tata McGraw Hill, (Revised Edition)
2. B.L.Theraja “Electrical Engineering “ Vol-I and II. 2. S.N.Singh, “Basic Electrical Engineering” PHI , 2011Book
3. Network Analysis, M. E. Van Valkenburg/T.S. Rathore, Pearson Education, 3rd Edition (2019).

4. Circuits and Networks: Analysis and Synthesis, A. Sudhakar and S.P. Shyammohan McGraw Hill Education (India) Private Limited; 5th edition (2015).

**Reference Books:**

1. Circuit Theory Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., Seventh - Revised edition (2018)
2. Mahmood Nahvi and Joseph A. Edminister, "Schaum's Outline of Electrical Circuits", McGraw-Hill Education, 7th Edition (2017).
3. Problems and Solutions of Electrical Circuit Analysis, R.K. Mehta & A.K. Mal, CBS Publishers and Distributors Pvt Ltd (2015).
4. Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011
5. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
6. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
7. M. Naidu, S. Kamakshiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004



**Course Name:** Data Structure

**Course Code:** EC03T

**Category:** Core

**Preamble:**

Data Structures deals with the organization, management, and manipulation of data. This course covers basic data structures and their algorithms, design and analysis principles, and real-world applications. By the end, students will be able to apply their knowledge to solve complex problems.

**Pre-requisites:**

ES04T (Structured Programming), ES05T (Object Oriented Programming)

**Course Objectives:**

- To understand the need and significance of Data structures as a computer Professional.
- To teach concept and implementation of linear and Nonlinear data structures.
- To analyze various data structures and select the appropriate one to solve a specific real-world problem.
- To introduce various techniques for representation of the data in the real world.
- To teach various hashing techniques.

**Course Outcomes:**

Learner will be able to:

CO1: Define different types of data structures and operations.

CO2: Implement linear data structure like stack or queue with operations.

CO3: Analyze the different types of linked lists like singly, doubly, and circular with operations.

CO4: Create and manipulate different types of trees with their properties and operations.

CO5: Create and represent graphs, including vertices, edges, adjacency matrix/ list, and traversal algorithms.

CO6: Apply different hashing techniques to efficiently retrieve and manipulate data.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

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The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Module Name	Content	No. of Hours
1	Introduction to Data Structures	Introduction to Data Structures, Concept of ADT, Types of Data Structures-Linear and Nonlinear, Operations on Data Structures.	2
2	Stack and Queue	Introduction, ADT of Stack, Operations on Stack, Array Implementation of Stack, Applications of Stack-Correctness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation, Recursion. Introduction, ADT of Queue, Operations on Queue, Array Implementation of Queue, Types of Queue-Circular Queue, Priority Queue, Double Ended Queue	7
3	Linked List	Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List, Stack and Queue using Singly Linked List	7
4	Trees	Introduction, Tree Terminologies, Binary Tree, Types of Binary Tree, Binary Tree Traversals, Binary Search Tree, Operations on Binary Search Tree, Applications of Binary Tree-Expression Tree, Huffman Encoding, Search Trees-AVL, rotations in AVL Tree, Introduction of B Tree, B+ Tree.	7
5	Graphs	Introduction, Graph Terminologies, Representation of Graph, Graph Traversals-Depth First Search (DFS) and Breadth First Search (BFS), MST using Kruskals and Prims Algorithm	5
6	Hashing	Hashing, Hash Functions, Collision resolution Techniques	2
<b>Total</b>			<b>30</b>

**Text Books:**

1. Reema Thereja, "Data Structures using C", 2<sup>nd</sup> edition, Oxford Press, 2014
2. Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, "Data Structures Using C", First Edition, Pearson Publication, 2019

**Reference Books:**

1. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENGAGE Learning, 2004.
2. P.S. Deshpande, O.G. Kakde, "C and Data Structures", First Edition, Dreamtech Press, 2003
3. E. Balagurusamy, "Data Structure Using C", First Edition, Tata McGraw-Hill Education India, 2013

**Course Name:** Data Structure Lab

**Course Code:** EC03P

**Category:** Core

**Preamble:**

The subject explores the fundamental concepts and practical applications of organizing and manipulating data efficiently. Through hands-on experiments and problem-solving, it aims to develop students' skills in implementing and analyzing various data structures.

**Pre-requisites:**

ES04P (Structured Programming Lab), ES05P (Object Oriented Programming Lab)

**Course Objectives:**

- To implement basic data structures such as arrays, linked lists, stacks and queues
- Solve problem involving graphs, and trees.
- To develop application using data structure algorithms

**Course Outcomes:**

Learner will be able to:

CO1: Implement Stack and be able to handle operations like insertion, deletion and traversing on them.

CO2: Implement different types of queues and be able to handle operations like insertion, deletion and traversing on them

CO3: Implement different types of linked list like Singly linked list, Circular linked list and Doubly linked list

CO4: Create and manipulate binary search tree with their properties and operations.

CO5: Implement graph traversal techniques such as DFS and BFS

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by

a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested List of Practicals:**

Learners are expected to perform minimum 12 practical based on the following suggested topics.

Sr. No.	Suggested Topic(s)	Number of Practicals
1	Implementation of stack using array	1
2	Stack Applications (Correctness of parenthesis, Infix to postfix conversion and Evaluation of postfix expression)	3
3	Implementation of different types of queues using array (Linear queue, Circular queue, Priority queue, Double Ended queue)	4
4	Implementation of different types of linked list (Singly linked list, Doubly linked list and Circular linked list)	3
5	Implementation of stack and queue using linked list	2
6	Implementation of binary search tree	1
7	Implementation of graph traversal techniques (DFS and BFS)	2

**Textbooks:**

1. Reema Thereja, "Data Structures using C", 2<sup>nd</sup> edition, Oxford Press, 2014
2. Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, "Data Structures Using C", First Edition, Pearson Publication, 2019

**Reference Books:**

1. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENGAGE Learning, 2004.
2. P.S. Deshpande, O.G. Kakde, "C and Data Structures", First Edition, Dreamtech Press, 2003
3. E. Balagurusamy, "Data Structure Using C", First Edition, Tata McGraw-Hill Education India, 2013

**Course Name:** Python Programming

**Course Code:** EC09T

**Category:** Core

**Preamble:**

Python is a popular, easy-to-learn, and powerful programming language with efficient high-level data structures and a simple yet effective approach to object-oriented programming. Its elegant syntax and dynamic typing make it ideal for scripting and rapid application development across multiple platforms. Python's built-in high-level data types, such as lists, tuples, and dictionaries, enable it to handle a more extensive problem domain than other languages, such as Awk or Perl. Additionally, Python's modules can be split into reusable components, which provides versatility across various domains, including gaming, statistical data analysis and visualization, and speech and face recognition.

Python's interpreted nature eliminates the need for compilation and linking, resulting in time savings during program development. The interpreter's interactive capability enables experimentation and testing of functions during program development. Python can be used for a wide variety of purposes, including web development, data analysis, machine learning, artificial intelligence, scientific computing, and more. In this subject, you will learn the basics of Python programming, including syntax, data types, control structures, functions, modules, and file handling.

**Pre-requisite:**

1. Structured Programming
2. Object Oriented Programming

**Course Objectives:**

- Describe the core syntax and semantics of Python programming language.
- Explore file handling in Python.
- Infer the Object-oriented Programming concepts in Python.
- Formulate GUI Programming and Databases operations in Python.

**Course Outcomes:**

After successful completion of the course students will be able to:

- CO1: Describe syntax and semantics in Python.
- CO2: Illustrate different file handling operations.
- CO3: Interpret object-oriented programming in Python.
- CO4: Design GUI Applications using Python.
- CO5: Understand databases using Python.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Unit No.	Contents	No. of Hours
1		<b>Introduction to Python Programming</b>	06
	1.1	Introduction to Python, Python Syntax, Comments, Variables (Local and Global), data types, Python Operators, Input Statements in python	
	1.2	Strings, Lists, Tuples, Dictionaries, Sets, Accessing Elements, Properties, Operations, and methods on these data structures.	
2		<b>Functions and File Handling</b>	08
	2.1	Built-in-functions, library functions, Defining and calling the functions, Return statements, Passing the arguments, Lambda Functions, Recursive functions, Modules and importing packages in python code.	
	2.2	File Handling, Read Files, Write/Create Files, Delete files	
3		<b>Object Oriented Programming</b>	08
	3.1	Classes and Objects, Public and Private Members, Class Declaration and Object Creation, Object Initialization, Class Variables and methods, Accessing Object and Class Attributes.	
	3.2	Inheritance, Constructor in Inheritance, Exception Handling	
4		<b>Graphical user Interface and Database Handling</b>	08
	4.1	Graphical User Interface using Tkinter Library module, creating simple GUI, Buttons, Labels, entry fields, widget attributes.	
	4.2	Database connection, Create, Append, update, delete records from database	
		<b>Total</b>	<b>30</b>

**Text Books:**

1. Yashvant Kanetkar, "Let us Python: Python is Future, Embrace it fast", BPB Publications; 1st edition (8 July 2019).
2. Dusty Phillips, "Python 3 object-oriented Programming", Second Edition PACKT Publisher, August 2015.
3. John Grayson, "Python and Tkinter Programming", Manning Publications (1 March 1999).
4. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech Press
5. Beginning Python: Using Python 2.6 and Python 3.1. James Payne, Wrox publication
6. Introduction to computing and problem solving using python, E Balagurusamy, McGraw Hill Education

**Reference Books:**

1. Eric Matthes, "Python Crash Course A hands-on, Project Based Introduction to programming" No Starch Press; 1st edition (8 December 2015).
2. Paul Barry, "Head First Python" O'Reilly; 2nd edition (16 December 2016)
3. Zed A. Shaw, "Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly
4. Beautiful World of Computers and Code", Addison Wesley; 3rd edition (1 October 2013).
5. Andreas C. Mueller, "Introduction to Machine Learning with Python", O'Reilly; 1st edition (7 October 2016)
6. David Beazley, Brian K. Jones, "Python Cookbook: Recipes for Mastering Python 3", O'Reilly Media; 3rd edition (10 May 2013).



**Course Name:** Python Programming Lab

**Course Code:** EC09P

**Category:** Core

**Preamble:**

Python is a well-known, simple-to-learn, and successful programming language that has good high-level data structures and a straightforward but efficient approach to object-oriented programming. Its graceful syntax and dynamic typing make it the best language for scripting and quick platform-agnostic application development. Python has high-level data types like lists, tuples, and dictionaries built in, Python can handle a wider range of problem domains than comparable languages like Awk or Perl. Python can be used for a wide variety of purposes, including web development, data analysis, machine learning, artificial intelligence, scientific computing, and more. In this lab, students will learn the basics of Python programming, including syntax, data types, control structures, functions, modules, and file handling.

**Pre-requisite:**

1. Structured Programming
2. Object Oriented Programming

**Course Objectives:**

- Understand the basic syntax and structure of Python programming language
- Define and use variables and data types in Python
- Use control structures such as conditional statements and loops to write Python programs
- Understand the concept of object-oriented programming and write Python programs using classes and objects
- Work with built-in Python modules and libraries
- Write Python programs that interact with files and databases
- Debug and test Python programs using various tools and techniques

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Students will be able to write Python programs using the correct syntax and structure, and will be familiar with Python's built-in functions and libraries.

CO2: Students will be able to define and use variables and data types in Python, and will understand the use of control structures such as conditional statements and loops.

CO3: Students will be able to write functions in Python and understand the concepts of parameter passing and return values, and will be able to use functions to solve problems.

CO4: Students will understand the concepts of object-oriented programming and be able to write Python programs using classes and objects.

CO5: Students will be able to work with built-in Python modules and libraries, and understand how to use them to solve problems.

CO6: Students will be able to debug and test Python programs using various tools and techniques, and will understand the importance of testing in the software development process.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested list of Practicals:**

Sr. No.	Experiment Title
1	<ol style="list-style-type: none"> <li>1) Write a Python program to add two numbers stored in a variable. Take input from the User.</li> <li>2) Write a Python program to find the number is even or odd. Take input from the User.</li> <li>3) Write a Python program to find the area of triangle.</li> </ol>
2	<ol style="list-style-type: none"> <li>1) Write a Python program to find whether the student will pass the IA exam or not. Take IA1 and IA2 marks from the user. Average the IA marks. If IA average is greater or equal to 7.5, he/she will pass the exam.</li> <li>2) Rohan takes 10000 rupees bank loan from the bank. The interest rate is 10% per year. How much interest he must pay after 3 years? Write a Python program and take input from user.</li> <li>3) A student will get admission in a college if he/she has CET merit rank less than 1000 and if his/her CET percentile is greater than 90. Write a Python program for the given problem statement and take input from the user.</li> </ol>
3	<ol style="list-style-type: none"> <li>1) Write a python program to arrange the numbers in ascending order.</li> <li>2) Write a python program to arrange the numbers in descending order.</li> <li>3) Write a python program to check whether the numbers are in the ascending order or not.</li> </ol>
4	<ol style="list-style-type: none"> <li>1) Write a python program to find even numbers from the list.</li> <li>2) Write a python program to find odd numbers from the list.</li> <li>3) Write a python program to make a single unique list from the given list: num1=[1,3,2,8,7] num2=[3,8,9,6,10]</li> <li>4) Write a python program to find how many times the number 7 is repeated in the roll number list: roll_num=[1,3,7,4,9,7,2,14,7,10,17,15,7,21]</li> </ol>
5	<ol style="list-style-type: none"> <li>1) Write a python program which can take your name as an input and password. If password is matched with the correct password (which you have mention in the program), Print the "Hello "with the name. If user entered wrong password, allow him/her 3 chance to re-enter the password.</li> </ol>

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	2) Write a python program which can take your name as an input and password. If password is matched with the correct password (which you have mention in the program), Print the "You can use Calculator "with the name. If user entered wrong password, allow him/her 3 chance to re-enter the password. If password match then the user can use calculator (addition, Subtraction, Multiplication, and division operation).
6	1) Design number guessing game using Python Programming. 2) Design quiz which has MCQ type questions. Calculate the final score and percentage and print it.
7	Design a Simple GUI calculator using Tkinter
8	Write a python program which can take multiple data entries from the user and save the data in text file. Perform read, write and append operations on the file using file handling concepts.
9	Write a python program for Mysql Database Connection <ul style="list-style-type: none"> <li>• create a database TESTDB.</li> <li>• create a table EMPLOYEE in TESTDB. <ul style="list-style-type: none"> <li>▪ This table has fields FIRST_NAME, LAST_NAME, AGE, SEX and INCOME.</li> </ul> </li> <li>• User ID "testuser" and password "test123" are set to access TESTDB.</li> <li>• Install Python module properly on machine.</li> <li>• Python code for connecting with MySQL database "TESTDB"</li> <li>• create tables or records into the database tables</li> <li>• Perform various operation like read, write and delete</li> </ul>
10	Project Detecting Fake News with Python
11	Project Color Detection with OpenCV and Pandas
12	Write a Python program to design smart desktop assistant which takes voice command as input and access youtube, google.com, Wikipedia, music files and whatsapp

**Reference Books:**

1. Eric Matthes, "Python Crash Course A hands-on, Project Based Introduction to programming" No Starch Press; 1st edition (8 December 2015).
2. Paul Barry, "Head First Python" O'Reilly; 2nd edition (16 December 2016)
3. Zed A. Shaw, "Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code", Addison Wesley; 3rd edition (1 October 2013).
5. Andreas C. Mueller, "Introduction to Machine Learning with Python", O'Reilly; 1st edition (7 October 2016)
6. David Beazley, Brian K. Jones, "Python Cookbook: Recipes for Mastering Python 3", O'Reilly Media; 3rd edition (10 May 2013).

## Detailed Syllabus of Second Year Semester - IV

**Course Name:** Principles of Economics and Management

**Course Code:** HS06

**Category:** Humanities, Social Sciences and Management

**Preamble:**

The subject of Principles of Economics and Management is a vital area of study that is essential for understanding the functioning of the modern economy and the business world. This subject provides students with a solid foundation in economic theory and business management principles that are necessary for success in today's dynamic and complex economic environment. Principles of Economics and Management encourages critical thinking and analytical skills, which are essential for decision-making and problem-solving in the business world. The subject also emphasizes the importance of ethical and sustainable practices in business management, which is crucial for promoting long-term success and societal well-being.

**Course Objectives:**

- To have a basic understanding of micro-economic and macroeconomic concepts.
- To enable the students to understand both the theory and practice of managerial economics.
- To introduce theories and concepts in micro-economics for managerial decision making,
- To help the students in applying the knowledge so acquired in policy planning and managerial decision making.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Critically assess and describe the environment and the main determinants of demand and competition facing the firm.

CO2: Distinguish between the different market structures and pricing practices available to and used by firms.

CO3: Use the tools of economic theory to explain optimal production and pricing decisions by the firm in each market structure.

CO4: Understand Business Cycles, GDP measures, Inflation and Deflation, and Unemployment measure

CO5: Understand Monetary System – Basics of Monetary and Fiscal Policy, Economic Growth and Development

CO6: Understand International Trade and Capital Flows Currency Exchange Rates, describe various exchange rate regimes.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
2	1	2	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory+Tutorial	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module no	Module Name	Content	No. of Hours
<b>Micro-Economics</b>			
1	Topics in Demand and Supply Analysis	Calculate and interpret price, income, and cross-price Elasticities of demand, compare substitution and income effects, distinguish between normal goods and inferior goods, phenomenon of diminishing marginal returns, economies of scale and diseconomies of scale	4
2	The Firm and Market Structures	Characteristics of perfect competition, monopolistic competition, oligopoly, and pure monopoly, relationships between price, marginal revenue, marginal cost, economic profit, and the elasticity of demand under each market structure, optimal price and output for firms, factors affecting long-run equilibrium, pricing strategy, type of market structure within which a firm operates	5
<b>Macro-Economics</b>			
3	Aggregate Output, Prices, and Economic Growth	Gross domestic product (GDP) using expenditure and income approaches, compare nominal and real GDP and calculate GDP deflator, compare GDP, national income, personal income, and personal disposable income, fundamental relationship among saving, investment, the fiscal balance, and the trade balance. IS and LM curves and how they combine to generate the aggregate demand curve, causes of movements along and shifts in aggregate demand and supply curves, distinguish between the following types of macroeconomic equilibria	5
4	Understanding Business Cycles	Business cycle and its phases, theories of the business cycle, unemployment and compare measures of unemployment, explain inflation, hyperinflation, disinflation, and deflation, inflation measures, including their uses and limitations, distinguish between cost-push and demand-pull inflation	4
5	Monetary and Fiscal Policy	Compare monetary and fiscal policy, functions and definitions of money, theories of the demand for and supply of money, the Fisher effect, roles and objectives of central banks, qualities of effective central banks, monetary transmission mechanism, relationships between monetary policy and economic	4

		growth, inflation, interest, and exchange rates, roles and objectives of fiscal policy, tools of fiscal policy, including their advantages and disadvantages	
<b>International Economics</b>			
6	International Trade and Capital Flows	Compare gross domestic product and gross national product, distinguish between comparative advantage and absolute advantage, compare types of trade and capital restrictions and their economic implications, describe the balance of payments accounts including their components; explain how decisions by consumers, firms, and governments affect the balance of payments; describe functions of World Bank, the International Monetary Fund, and the World Trade Organization	4
7	Currency Exchange Rates	Exchange rate and distinguish between nominal and real exchange rates and spot and forward exchange rates, calculate and interpret the percentage change in a currency relative to another currency, explain the arbitrage relationship between spot rates, forward rates, and interest rates, calculate and interpret a forward discount or premium, describe exchange rate regimes	4
<b>Total</b>			<b>30</b>

**Suggested List of Tutorials:**

1. Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and the consequences of government intervention.
2. Derive the equilibrium conditions for cost minimization and profit maximization for 2 companies.
3. List the different goals and constraints that firms face.
4. Calculate Indian gross domestic product (GDP) using expenditure and income approaches
5. Compare GDP, national income, personal income, and personal disposable income for India
6. Explain the relationships between monetary policy, currency conversion, and exchange rates

**Skill Set Acquired:**

1. Understand why there is a role for the government to play in market economies.
2. Apply the economic way of thinking to individual decisions and business decisions.
3. Measure the responsiveness of consumers' demand to changes in the price of a good or service, the price of other goods and services, and income.
4. Understand the different costs of production and how they affect short and long run decisions.

**Text Books:**

1. Mankiw, N Gregory. (2011). Economics: Principles and Applications. Cengage Lrng.
2. Lipsey, Richard; Christal, Alec. (2007). Economics (2nd Edition) Oxford Univ Press.
3. Prof. Sahuraja, R.R. (December 2015). Managerial Economics (2ndEdition)

**Reference Books:**

1. Hirschey, Mark. Economics for Managers
2. Salvatore, Dominik; Rastogi, Siddharth. Managerial
3. Mankiw, N G. Ten Principles of Economics (PPT)
4. Banerjee and Warriar. (2018). "Macroeconomics – Theories and Applications". Sage Publications

**Course Name:** Engineering Mathematics-IV

**Course Code:** BS08

**Category:** Basic Science

**Preamble:**

This course introduces students to Engineering Mathematics-IV, with detailed Mathematical introduction to Complex Integration, Vector Spaces and Statistical Techniques like Probability Distribution, Correlation and Regression which are widely applicable in Electronics and Computer Science Engineering. This Course will also offer in-depth understanding of fundamental and theoretical underpinnings, applications, best practices, and research activities.

**Pre-requisites:**

Engineering Mathematics-I, II, III and Basic Mathematics of XI and XII std.

**Course Objectives:**

- To understand complex Integration concept and apply to evaluate integrations.
- Understanding the fundamentals of linear algebra with advanced matrices and Vector Spaces, Statistical Techniques like Probability Distribution and Correlation and Regression to solve real world problems.
- To create a strong foundation by studying the basics of Engineering Mathematics and interfacing to various peripherals which will lead to a well-designed based System.
- To provide students with the sound foundation of Mathematics, Science, and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and prepare them for Graduate studies.
- To impart knowledge of interfacing techniques and educate the student in the domain of Electronics and Computer Science Engineering.

**Course Outcomes:**

Student will be able to:

CO1.Develop the ability to understand the basics of Complex Integration and Residues.

CO2.Evaluate their Mathematical ideas for solving various properties of Matrices and their Eigen values. and Eigen vectors.

CO3.Understand the basics of Vector Spaces used in the field of Machine learning, AI, and Data science.

CO4.Learn the basics of Calculus of Variation and its applications to find extremals of the functional.

CO5.Understand the basics of Probability, Moment generating functions and Probability. distributions.

CO6.Understand the basic statistical techniques like Correlation and Regression lines for the field of Data analysis.



Programme Scheme & Syllabus (R-2022) for Second Year Bachelor of Technology (B.Tech.)  
Electronics and Computer Science

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
3	-	3	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus**

Module No.	Module Name	Content	No. of Hours
1	Complex Integration	Line Integral, Cauchy's Integral Theorem, Cauchy's Integral formula. Taylor's and Laurent's Series, Zeros, singularity, poles of (z), residues, Cauchy's Residue theorem.	8
2	Linear Algebra: Advance Matrix Theory	Eigen values and Eigen vectors Properties, Cayley Hamilton theorem (without proof), examples based on verification of Cayley Hamilton Theorem. Function of square matrices e.g., $\tan(A)$ , $A^n$ , $k^A$ , etc	8
3	Linear Algebra: Vector Spaces	$n$ -dimensional vector space, Norms, Inner product, Cauchy-Schwarz Inequality (with proof). Vector spaces over a real field, Subspaces, Orthonormal basis, Gram-Schmidt process for vectors.	8
4	Calculus of Variation	Euler Lagrange equations (only results for different cases for functional) Isoperimetric problems, Functions involving higher order derivatives, Rayleigh-Ritz method.	7
5	Probability Distributions	Random Variable: Probability distribution for discrete and continuous random variable, Bayes Theorem (without proof) Expectation, Variance, Moment generating function (definition only) , Probability distributions, Poisson, and Normal distributions.	8
6	Statistical Techniques	Correlation: Covariance, Karl Pearson's Correlation Coefficient. Spearman's rank correlation coefficient, Regression lines, fitting of curves.	6
<b>Total</b>			<b>45</b>

**Textbooks:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & sons, 10<sup>th</sup> Edition.
2. Dr. B V Ramana "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, India 2006
3. P N Wartikar and J N Wartikar "*Textbook of Applied Mathematics Volume I & II*", Vidyarthi Ghriha Prakashan Pune 2005 9<sup>th</sup> Edition.
4. N P Bali and Manish Goyal, "A textbook of Engineering Mathematics", Laxmi Publication 2006.

**Reference Books:**

1. Dr. B S Grewal, "Higher Engineering Mathematics", Khanna Publication, 44<sup>th</sup> Edition.
2. C. R. Wylie & L. C. Barrett, "Advanced Engineering Mathematics", Tata McGraw India, 6<sup>th</sup> Edition.
3. H K Das, "Advanced Engineering Mathematics", S Chand, 22<sup>nd</sup> Edition.
4. Kenneth Hoffman. "Linear Algebra", Pearson 2018.
5. Seymour Lipschutz, "Schaum's Outline of Linear Algebra", Tata McGraw India, 6<sup>th</sup> Edition.
6. Seymour Lipschutz, "Schaum's Outline of Probability and Statistics", Tata McGraw India, 1<sup>st</sup> Edition.
7. T. Veerarajan, "Probability, Statistics and Random processes", Tata McGraw India, 2<sup>nd</sup> Edition.
8. Robert Weinstock, "Calculus of variation with application to physics and Engineering", Dover Publications, New York, 1<sup>st</sup> Edition.

**Course Name:** Computer Organization & Architecture

**Course Code:** EC04T

**Category:** Core.

**Preamble:**

A professional in any field of computing should not regard the computer as just a black box that executes programs by magic. All students of computing should acquire some understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions. Students need to understand the addressing modes, instruction set of a microprocessor and should be able to develop simple application programs.

**Pre-requisite:**

- Digital Electronics
- Fundamental concepts of processing

**Course Objectives:**

- To introduce the learner to the design aspects this can lead to maximized performance of a Computer.
- To introduce the learner to various concepts related to Parallel Processing
- To highlight the various architectural enhancements in modern processors.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Define the performance metrics of a Computer

CO2: Distinguish between CISC and RISC Design Philosophies

CO3: Explain the design considerations of Processor, Memory and I/O in Computer systems

CO4: Analyze the advantages and limitations of Parallelism in systems

CO5: Apply the principles of pipelining to improve performance

CO6: Concept of assembly language programming and will be able to develop assembly language program

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

Programme Scheme & Syllabus (R-2022) for Second Year Bachelor of Technology (B.Tech.)  
Electronics and Computer Science

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Unit No.	Contents	No. of Hours
1		<b>Introduction to Computer Organization</b>	04
	1.1	Fundamental Units of a Computer	
	1.2	Introduction to Buses	
	1.3	Number Representation methods- Integer and Floating-point, Booth's Multiplier	
	1.4	Basic Measures of Computer Performance - Clock Speed, CPI, MIPs and MFlops	
2		<b>Processor Organization and Architecture</b>	06
	2.1	CPU Architecture, Register Organization, Instruction cycle, Instruction Formats, Addressing Modes	
	2.2	Control Unit Design- Hardwired and Micro-programmed Control: Vertical and Horizontal Micro-Instructions, Nano-programming	
3		<b>8086 Microprocessor</b>	06
	3.1	Architecture of 8086	
	3.2	Instruction set of 8086	
	3.3	Assembler directives and assembly language programming with 8086	
4		<b>Memory Organization</b>	06
	4.1	Classification of Memories-Primary and Secondary Memories, RAM (SRAM and DRAM) and ROM (EPROM, EEPROM)	
	4.2	Memory Hierarchy, Cache Memory Concepts, Mapping Techniques, Write Policies	
	4.3	Virtual Memory Management-Concept, Paging, Page Replacement policies	
5		<b>Input/Output Organization</b>	04
	5.1	Types of I/O devices and Access methods, Types of Buses, Bus Arbitration	
	5.2	Direct Memory Access (DMA)	
6		<b>Parallelism</b>	04
	6.1	Introduction to Parallel Processing Concepts, Flynn's classification, Amdahl's law	
	6.2	Pipelining - Concept, Speedup, Efficiency, Throughput, Types of Pipeline hazards and solutions	
		<b>Total</b>	<b>30</b>

**Textbooks:**

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", Eighth Edition, Pearson.
2. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw Hill, 2002.

**Reference Books:**

1. J.P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.
2. B. Govindarajulu, "*Computer Architecture and Organization: Design Principles and Applications*", Second Edition, Tata McGraw-Hill.
3. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann, 1998.

**Course Name:** Computer Organization & Architecture Lab

**Course Code:** EC04P

**Category:** Core

**Preamble:**

A professional in any field of computing should not regard the computer as just a black box that executes programs by magic. All students of computing should acquire some understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions. Students need to understand the computer architecture to make best use of the software tools and computer languages they use to create programs. In this introduction, the term architecture is taken to include instruction set architecture, organization, or micro architecture (the internal implementation of a computer at the register and functional unit level), and system architecture (the organization of the computer at the cache, and the bus level).

**Pre-requisite:**

- Digital Electronics- logic gates
- Fundamentals of different programming languages

**Course Objectives:**

- To introduce learners with basic principles about computer architecture, machine language, and low-level programming.
- To introduce learners with enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
- To Improving learners systems programming skills through programming exercises carried out by students.
- Learners are expected to implement solutions to problems using the concepts they will take through the course.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Understand instruction set/format of a microprocessor.

CO2: Understand concept of assembly language programming.

CO3: Develop assembly language program for simple applications.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

Programme Scheme & Syllabus (R-2022) for Second Year Bachelor of Technology (B.Tech.)  
Electronics and Computer Science

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested list of Practicals:**

Sr. No.	Practicals
1	Introduction to assembler directives
2	Introduction to assembler like TASM, MASM etc.
3	ALP using ADD, SUB, MUL, DIV instructions
4	ALP using AND, OR, XOR instructions
5	ALP for BCD to ASCII & ASCII to BCD conversion
6	ALP for HEX to ASCII & ASCII to HEX conversion
7	ALP to find out smallest & largest of the array
8	ALP to sort the array in ascending & descending order
9	ALP using BIOS routine for keyboard interface
10	ALP using BIOS routine for display interface

**Course Name:** Control Systems Engineering

**Course Code:** EC05T

**Category:** Core

**Preamble:**

Control systems are widely used in various fields, such as aerospace, automotive, chemical, and electrical engineering. In this subject, we will study the principles of Control Systems, including modelling of physical systems using differential equations, transfer function representation, stability analysis, and performance measures such as transient response and steady-state error. By the end of this course, learner will gain a deep understanding of Control Systems and be able to design and implement feedback control systems for a wide range of practical applications.

**Pre-requisite:**

Engineering Mathematics 1,2,3

**Course Objectives:**

1. To develop the understanding of fundamental principles of control systems.
2. To disseminate the basic methods for time-domain and frequency-domain analysis of control systems.
3. To develop the concept of stability and its assessment for linear-time-invariant systems.

**Course Outcomes:**

CO1: Describe basic concepts of control system such as open loop, closed loop, feedback and feed forward systems.

CO2: Develop the mathematical model of different type of systems.

CO3: Analyse systems using state space techniques.

CO4: Analyse stability in time domain using root locus and BIBO stability.

CO5: Examine correlation between stability analysis of systems in time and frequency domain.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.



**Detailed Syllabus:**

Module no	Module name	Content	No of Hours
1	Introduction to Control System Analysis	Open loop and closed loop systems; Feedback and feed forward control structure; Examples of control systems.	2
2	Mathematical Modelling of Systems	Transfer function models of systems, Models of electrical systems, Block diagram reduction; Signal flow graph and the Mason's gain rule.	5
3	Transient and steady state behaviour.	Standard test signals; Transient and steady state behaviour of first and second order systems; Type and order of feedback control systems and steady state error analysis	5
4	State Variable Models	State variable models of systems. Concept of state transition matrix; Properties of state transition matrix; Solution of homogeneous systems. Concept of controllability and observability;	6
5	Stability Analysis in Time Domain	Concept of stability; Routh Hurwitz stability criterion; Root-locus concepts; Root locus analysis of control systems.	6
6	Stability Analysis in Frequency Domain:	Relationship between time and frequency domain of systems; Stability margins. Magnitude and phase plot; Method of plotting Bode plot; Stability margins on the Bode plots; Stability analysis using Bode plot.	6
<b>Total</b>			<b>30</b>

**Text Books:**

1. Nise, Control systems Engineering - wse wiley publication
2. Ogatta, Modern Control Engineering - PHI Publication.
3. J.Nagrath and M.Gopal - Control systems Engineering.(New Edition)

**Reference Books:**

1. S.C. Goyal and U.A.Bakshi - Principles of control systems.
2. Hadi Saadat - Computational aids in control systems using MATLAB.
3. Kuo, Golnaraghi- Automatic Control System- WSE Willey Publication.
4. Rudra pratap -MATLAB FUNDAMENTALS

**Course Name:** Control Systems Engineering Lab

**Course Code:** EC05P

**Category:** Core

**Preamble**

Control systems are widely used in various fields, such as aerospace, automotive, chemical, and electrical engineering. In this subject, we will study the principles of Control Systems, including modelling of physical systems using differential equations, transfer function representation, stability analysis, and performance measures such as transient response and steady-state error. By the end of this course, the learner will gain a deep understanding of Control Systems and be able to design and implement feedback control systems for a wide range of practical applications.

**Pre-requisite:**

Engineering Mathematics 1,2,3

**Course Objectives:**

- To develop the understanding of fundamental principles of control systems.
- To disseminate the basic methods for time-domain and frequency-domain analysis of control systems.
- To develop the concept of stability and its assessment for linear-time-invariant systems.

**Course Outcomes:**

CO1: Understand basic concepts of control systems such as open loop, closed loop, feedback and feed forward systems.

CO2: Develop the mathematical model of different types of systems.

CO3: Analyse systems using state space techniques.

CO4: Analyse stability in time domain using root locus and BIBO stability.

CO5: Examine correlation between stability analysis of systems in time and frequency domain.

**ISA:**

At least 10 experiments covering the entire syllabus of Control Systems Engineering should be set to have well predefined inference and conclusion. The experiments should be student centric, and attempts should be made to make experiments more meaningful and interesting. Simulation experiments are also encouraged. Experiments must be graded from time to time. Practical and Oral exams will be based on the entire syllabus.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Experiments is provided; However, Instructor is free to design own experiments as per the guidelines

**List of Experiments:**

1. Familiarization with MATLAB control system tool box, MATLAB/Simulink tool box.
2. Verification of Block reduction rules
3. To solve a differential equation model using simulation software.
4. To find the Steady state error of for a type '0', type '1', Type '2' systems in response to standard test signals
5. Determination of step & impulse response for a second order unity Feedback system
6. Stability analysis using Routh Hurwitz Criteria
7. PBL – Quick and accurate weighing system for continuous conveyed materials is important to most of continuous production manufacturing process, especially granular bulk materials. Use a method to make a better estimate of the digital filtering that is required to satisfy a given vibration rejection requirement for better precision and faster response speed.
8. Evaluating the Controllability and Observability of Systems
9. Determination of step & impulse response for a type '0', type '1', Type '2' systems
10. Determination of bode plot using MATLAB control system toolbox for 2nd order system.
11. Determination of root locus plot using MATLAB control system Toolbox for 2nd order system
12. PBL-It is desired to automate insulin infusion and maintain the glucose level based on switching technique. Design a system for the same.
13. PBL- A mass damper system and a spring connected system experience the same force. Give an analysis of their response with reasons. Circuits and systems

**Text Books:**

1. Nise, Control systems Engineering - wse wiley publication
2. Ogatta, Modern Control Engineering - PHI Publication.
3. J.Nagrath and M.Gopal - Control systems Engineering.(New Edition)

**Reference Books:**

1. S.C. Goya! and U.A.Bakshi - Principles of control systems.
2. Hadi Saadat - Computational aids in control systems using MATLAB.
3. Kuo, Golnaraghi- Automatic Control System- WSE Willey Publication.
4. Rudra pratap -MATLAB FUNDAMENTALS

**Course Name:** Signals and Systems

**Course Code:** EC06T

**Category:** Core

**Preamble:**

Signals play an important role in our life. Generally, a signal can be a function of time, distance, position, temperature, pressure, etc., and represents some variable of interest associated with the system. The objective of signal processing is to extract information from the signal. Signal processing is concerned with representing the signal in mathematical terms and extracting the information by carrying out algorithmic operations on the signal. Digital processing of a signal has a major advantage over analog techniques.

**Pre-requisite:**

Engineering Mathematics 1,2,3 & ECA

**Course Objectives:**

- To introduce the mathematical concepts of continuous and discrete time signals and systems.
- To acquaint the students with various time domain and frequency domain methods for analysis of signals and systems.
- To introduce Fourier domain analysis of signals and systems and their efficient implementation.
- To expose students to various design techniques for FIR/IIR filters.

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Identify and differentiate between continuous and discrete time signals and systems.

CO2: Develop input output relationship for LTI systems.

CO3: Analyze LTI CT and DT system in frequency domain.

CO4: Analyze discrete time systems in frequency domain using Discrete Fourier Transform.

CO5: Design IIR digital filters to meet given filter specifications.

CO6: Design FIR digital filters to meet given filter specifications.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a  
Vidyalankar Institute of Technology (An Autonomous Institute affiliated to University of Mumbai)

panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Unit No.	Contents	No. of Hours
1	1.1	<b>Classification of Signals and operations of signals</b> classification of CT and DT signals	06
	1.2	operations on the independent and dependent variables	
2	2.1	<b>Classification of system and analysis in time domain</b> classification of CT and DT systems	06
	2.2	Properties of LTI systems, impulse	
	2.3	Analysis of CT LTI systems using convolution integral and DT LTI systems using convolution sum. Properties convolution	
	2.4	Circular convolution	
3	3.1	<b>Frequency Domain Analysis of Continuous Time System and DT system</b> Pole and zero plot in S domain and Z domain	04
	3.2	Analysis and characterization of CT LTI system using Laplace transform: Impulse and step response, causality, stability of CT system	
	3.3	Analysis and characterization of DT LTI system using Z transform: impulse and step response, causality and stability of DT LTI system	
4	<b>Discrete Fourier Transform and Fast Fourier Transform</b>		06
	4.1	Definition and Properties of DFT, IDFT, circular convolution of sequences using DFT and IDFT, Relation between Z-transform and DFT, Filtering of long data sequences using Overlap Save and Overlap Add Method	
	4.2	Fast Fourier transforms (FFT), Radix-2 decimation in time FFT algorithms, Goertzel Algorithm, Inverse FFT	
5	<b>Design of Infinite Impulse Response (IIR) Filters</b>		04
	5.1	Analog filter approximations: Butterworth, Chebyshev	
	5.2	Mapping of S-plane to Z-plane: Impulse invariance method, Bilinear transformation method, Design of IIR digital filters from analog filters with examples (Butterworth, Chebyshev)	
6	<b>Design of Finite Impulse Response (FIR) Filters</b>		04
	6.1	Characteristics of FIR digital filters, Minimum Phase, Maximum Phase, Mixed Phase and Linear Phase Filters, Frequency response and location of zeros for linear phase FIR filters	
	6.2	Effect of truncation on ideal filter impulse response, Design of FIR filters using window techniques (Rectangular, Hamming, Hanning, Blackmann, Bartlet)	
<b>Total</b>			<b>30</b>

**Textbooks:**

1. Signal processing and linear systems: Lathi, Bhagwandas Pannalal, and Roger A. Green. New York: Oxford University Press, 1998.
2. Signals & Systems: Kani, A. Nagoor.. Tata McGraw-Hill Education, 2010.
3. Signals and Systems: Tarun Kumar Rawat, Oxford University, 1st Edition
4. Digital Signal Processing: Proakis J., Manolakis D, Pearson Education, 4th Edition
5. Tarun Kumar Rawat, "*Digital Signal Processing*", Oxford University Press, 2015

**Reference Books:**

1. Oppenheim A., Schafer R., Buck J., "*Discrete Time Signal Processing*", 2nd Edition, Pearson Education
2. Johnson J. R., "*Introduction to Digital Signal Processing*", Prentice Hall
3. Emmanuel C. Ifeachor, Barrie W. Jervis, "*Digital Signal Processing: A Practical Approach*", Pearson Education, 2001
4. Sanjit K. Mitra, Digital Signal Processing – A Computer Based Approach – edition 4e McGraw Hill Education (India) Private Limited
5. B. Venkata Ramani and M. Bhaskar, "*Digital Signal Processors, Architecture, Programming and Applications*", Tata McGraw Hill, 2011.

**Course Name:** Signals & Systems Lab

**Course Code:** EC06P

**Category:** Core

**Preamble:**

Signals play an important role in our life. Generally, a signal can be a function of time, distance, position, temperature, pressure etc., and represents some variable of interest associated with the system. The objective of signal processing is to extract information from the signal. Signal processing is concerned with representing the signal in mathematical terms and extracting the information by carrying out algorithmic operations on the signal. Digital processing of a signal has a major advantage over analog techniques.

**Pre-requisite:**

Engineering Mathematics 1,2,3 & ECA

**Course Objectives:**

- The primary objective of this course is to provide a thorough understanding and analysis of signals and systems using MATLAB.
- To implement Linear and Circular Convolution
- To implement FIR and IIR filters

**Course Outcomes:**

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

CO1: Understand the basics of MATLAB syntax, functions, and programming.

CO2: Generate and characterize various continuous and discrete-time signals and perform basic operations.

CO3: Design and analyze linear time-invariant (LTI) systems and compute their response.

CO4: Analyze the spectral characteristics of signals using Fourier analysis, Laplace Transform, DFT, and Z transform.

CO5: To design FIR and IIR filters.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**ISA:**

At least 10 experiments covering entire syllabus of EC06T (Signals & System) should be set to have well predefined inference and conclusion. The experiments should be student centric, and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. Practical and Oral exam will be based on the entire syllabus.

Suggested List of Experiments is provided, however Instructor is free to design own experiments as per the guidelines

**Suggested list of Experiments**

Sr. No.	Experiment Title
1	Generation of Signals using MATLAB/Python
2	Find Unit impulse response of LTI system in time domain
3	Find LTI system output for given input signal (Linear Convolution)
4	Find LTI system output for given periodic input signal (Circular Convolution)
5	Compute DFT for given signal and plot magnitude and phase plot.
6	Computation of circular convolution using DFT and IDFT approach
7	Compute filter output data for a long sequence using overlap add method
8	IIR LPF Butterworth filter design using IIT /BLT technique
9	IIR LPF Chebyshev filter design using BLT/ IIT technique
10	Design of FIR filter using hamming and Hanning window
10	Compute filter output data for a long sequence using overlap save method
11	Find DFT of a sequence using virtual lab
12	Select Music Signal. Separation of high frequency and low frequency data and play it separately. <ol style="list-style-type: none"> <li>1. Plot frequency plot for the music.</li> <li>2. Identify cutoff frequency for LPF and HPF.</li> <li>3. Design LPF and HPF filter.</li> <li>4. Apply the filter to original music and play output separately. (PBL)</li> </ol>



**Course Name:** Web Technology

**Course Code:** EC07T

**Category:** Core

**Preamble:**

This course is designed to provide students with a comprehensive understanding of the principles and practices involved in web technology. It covers topics such as HTML, CSS, JavaScript, web development frameworks, web servers, and web security.

**Pre-requisite:**

Fundamentals of different programming languages

**Course Objectives:**

- To design and create web pages using HTML5 and CSS3.
- To implement client side scripting to static web pages.
- To create dynamic web pages using server side scripting.
- To gain ability to develop responsive web applications and explore different web extensions and web services standards

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1: Implement interactive web page(s) using HTML and CSS.

CO2: Design a responsive web site using JavaScript and demonstrate database connectivity using JDBC

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module no:	Module name	Content	No of Hours
1	Introduction to HTML5	Basic structure of an HTML5 document, Creating an HTML5 document, Mark up Tags, Heading-Paragraphs, line Breaks HTML5 Tags - Introduction to elements of HTML, Working with Text, Lists, Tables and Frames, Hyperlinks, Images and Multimedia HTML Forms and other HTML5 controls	5
2	Designing Static Web Pages	Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute selector	4
3	Bootstrap	Introduction to Bootstrap, downloading and installing Bootstrap. 4.2 The Grid System, CSS Foundations, Navigation Systems, JavaScript Effects. Self-Learning: Bootstrap Customization-Combining Elements in Bootstrap, Customizing by Components, Plugins, and Variables	3
4	Front End Development	Java Script: An introduction to JavaScript-JavaScript DOM Model Date and Objects-Regular Expressions-Exception Handling Validation-Built-in objects-Event Handling, DHTML with JavaScript JSON introduction – Syntax – Function Files – Http Request –SQL	7
5	ReactJS	Introduction to ReactJS, JSX, Class, Component, Props, Events, Conditionals, Lists, Forms, Router, Memo, CSS styling, Sass Styling, React Hooks	4
6	Back End Development	Servlets: Java Servlet Architecture, Servlet Life Cycle, Form GET and POST actions, Session Handling, Understanding Cookies, Installing and Configuring Apache Tomcat Web Server, Database Connectivity: JDBC perspectives, JDBC program example JSP: Understanding Java Server Pages, JSP Standard Tag Library (JSTL), Creating HTML forms by embedding JSP code.	7
<b>Total</b>			<b>30</b>

**Text Books:**

1. Ralph Moseley , M.T. Savliya , —Developing Web Applications||, Willy India, Second Edition,
2. Achyut S Godbole and AtulKahate, —Web Technologies, Second Edition, Tata McGraw Hill, 2012.
3. Web Technology Black Book||, Dreamtech Press, First Edition, 978-7722-997
4. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY,2014.  
([http://www.ebooksbucket.com/uploads/itprogramming/javascript/Learning\\_PHP\\_MySQL\\_Javascript\\_CSS\\_HTML5\\_\\_Robin\\_Nixon\\_3e.pdf](http://www.ebooksbucket.com/uploads/itprogramming/javascript/Learning_PHP_MySQL_Javascript_CSS_HTML5__Robin_Nixon_3e.pdf))

**Reference Books:**

1. Professional Rich Internet Applications: AJAX and Beyond, Dana Moore, Raymond Budd, Edward Benson, Wiley publications. <https://ebooks-it.org/0470082801-ebook.htm>
2. Jennifer Kyrnin, —SAMS Teach Yourself Bootstrap in 24 hours||, 1st edition, Pearson Education.
3. Martin Bean, —Laravel 5 Essentials||, PACKT Publishing Ltd 7. Kirupa Chinnathambi, —Learning React|| , Addison-Wesley Professional

**Course Name:** Web Technology Lab

**Course Code:** EC07P

**Category:** Core

**Preamble:**

This lab is designed to provide hands-on experience in developing web applications using web technologies such as HTML, CSS, JavaScript, and web development frameworks. Students will work on projects that involve creating responsive web designs, developing interactive web pages, and implementing security measures in web applications.

**Pre-requisite:**

Fundamentals of different programming languages

**Course Objectives:**

- Develop practical skills in web development
- Apply web development principles and practices in real-world scenarios
- Develop proficiency in HTML, CSS, and JavaScript
- Learn how to use web development frameworks to create web applications
- Implement security measures in web applications

**Course Outcomes:**

After successful completion of the course students will be able to:

CO1 : Understand instruction set/format of a microprocessor.

CO2 : Understand concept of assembly language programming

CO3 : Develop assembly language program for simple applications.

Guidelines to conduct practical sessions and Mini projects for ISA:

At least 7 experiments covering entire syllabus of EC07T (Web Technology Lab) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. . Practical and Oral exam will be based on the entire syllabus.

1. To encourage project-based learning in the curriculum, mini project is mandatory in a group of four students.
2. In addition to the Mini project work each student needs to perform laboratory experiments during lab sessions.
3. Practical assessment should be done on weekly basis and Mini project assessment at least twice in a semester.
4. Preferably certify the practical work during the last practical session.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested List of Experiments:**

Sr. No.	Experiment Title												
1	a. Installation and Setting of LAMP / WAMP / XAMP. b. Create Simple web page using HTML5 c. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.												
2	a. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style. b. Design and Implement web page using CSS3 and HTML5 c. Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open. d. Create web Pages using Anchor tag with its attributes for external links. e. Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.												
3	Project 1: Design a webpage to display student Profile page using HTML & CSS.												
4	Create the following table in HTML with Dummy Data: <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Reg. Number</th> <th>Student Name</th> <th>Year / Semester</th> <th>Date of Admission</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Reg. Number	Student Name	Year / Semester	Date of Admission								
Reg. Number	Student Name	Year / Semester	Date of Admission										
5	Create a web page which divides the page in two equal frames and place the audio and video clips in frame-1 and frame-2 respectively. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50%;">FRAME-1</td> <td style="width: 50%;">FRAME-2</td> </tr> </table>	FRAME-1	FRAME-2										
FRAME-1	FRAME-2												

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	Project 2:Design a Gym website using CSS & Java script.
6	Form Design and Client Side Validation using a. Javascript and HTML5 b. Javascript and JQuery
7	Project 3:Design a Responsive login Page & Registration Page.
8	Develop interactive web pages using JDBC with database connectivity MYSQL
	How to add Image to MySql database using Servlet and JDBC
9	Web page designing using Bootstrap
10	Project 4: Design a Responsive Web site for hall booking System.
11	Project 5: Design a Responsive website for Library management.
12	Project 6 : Individual Mini Project to Design a responsive website

**Reference Books:**

1. "Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett
2. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
3. "Responsive Web Design with HTML5 and CSS3" by Ben Frain
4. "Don't Make Me Think: A Common Sense Approach to Web Usability" by Steve Krug
5. "Web Design for Developers: A Programmer's Guide to Design Tools and Techniques" by Brian Hogan

**Course Name:** Database Management System

**Course Code:** EC08T

**Category:** Core

**Preamble:**

Database Management Systems course is intended to deliver students the elementary concepts of a database management system and enable them to design and implement a database application built over such concepts. It also introduces advanced level areas like transaction processing, concurrency control and recovery management.

**Pre-requisite:**

Data Structure

**Course Objectives:**

- To identify, define problem statements and construct conceptual data model for real life applications.
- To build Relational Model from conceptual model (ER/EER).
- To apply SQL to store and retrieve data efficiently.
- To demonstrate notions of normalization for database design.

**Course Outcomes:**

After successful completion of the course, students will be able to students will be able to:

CO1: Construct problem definition statements for real life applications and implement a database for the same.

CO2: Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.

CO3: Map ER diagram into tables in relational model

CO4: Write queries in SQL to retrieve any type of information from a data base.

CO5: Analyze and apply concepts of normalization to design an optimal database.

CO6: Simulate concurrency issues such as deadlocks and elaborate the solution.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a

panel constituted at institute level and published to the learners before the commencement of the semester.

**Detailed Syllabus:**

Module No.	Unit No.	Contents	No. of Hours
1	1.1	<b>Ch.1: Database System Concepts and Architecture</b>	03
		Introduction, Characteristics of Databases, File system v/s Database system, Data abstraction and Data Independence, DBMS system architecture, Database Administrator (DBA), Role of DBA	
2	2.1	<b>Ch.2: The Entity-Relationship Model</b> The Entity-Relationship Model Conceptual Modeling of a database, The Entity-Relationship (ER) Model, Entity Type, Entity Sets, Attributes and Keys	05
	2.2	Relationship Types, Relationship Sets, Weak entity Types, Generalization, Specialization and Aggregation	
3		<b>Relational Model and Relational Algebra</b>	06
	3.1	Introduction to Relational Model, Relational Model Constraints and Relational Database Schemas, Concept of Keys: Primary Key, Secondary key, Foreign Key,	
	3.2	Mapping the ER and EER Model to the Relational Model, Introduction to Relational Algebra, Relational Algebra expressions for Unary Relational Operations, Set Theory operations, Binary Relational operation Relational Algebra Queries	
4		<b>Structured Query Language (SQL)</b>	08
	4.1	Overview of SQL, Data Definition Commands, Set operations, aggregate function, null values, Data Manipulation commands, Data Control commands, Complex Retrieval Queries using Group By, Recursive Queries, nested queries.	
	4.2	Integrity constraints in SQL. Database Programming with JDBC, Security and authorization: Grant & Revoke in SQL Functions and Procedures in SQL and cursors.	
5		<b>Relational-Database Design</b>	04
	5.1	Pitfalls in Relational-Database designs , Concept of normalization	
	5.2	Function Dependencies, First Normal Form, 2nd , 3rd , BCNF, multi valued dependencies, Transaction Concept, Transaction States, ACID properties	
6		<b>Transactions Mgmt. and Concurrency</b>	04
	6.1	Introduction to XML Database: XML Document   XML Schema   XML Query Tools	
		<b>Total</b>	<b>30</b>



**Text Books:**

1. Database System Concepts, Korth, Silberchatz, Sudarshan, McGraw – Hill Publications, Sixth Edition
2. Fundamentals of Database Systems, Elmasri and Navathe, PEARSON Education, Fifth Edition.

**Reference Books:**

1. Database System Implementation, Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, Pearson Education.
2. Database Management Systems Raghu Ramkrishnan and Johannes Gehrke, Tata McGraw Hill.

**Course Name:** Database Management System Lab

**Course Code:** EC08P

**Category:** Core

**Preamble:**

Database Management Systems Lab course is intended to deliver students the elementary concepts of a Structured Query Language and enable them to design and implement a database application built over concepts of SQL. It also introduces concepts of Triggers, Joins & views.

**Pre-requisite:**

Data Structure

**ISA:**

At least 08 experiments covering entire syllabus of ELL 407 (Database Management Systems Lab) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Problem Based experiments are highly encouraged. Experiment must be graded from time to time.

**Course Scheme:**

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

**Assessment Guidelines:**

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

**Suggested List of Experiments** is provided; however, Instructor is free to design own experiments as per the guidelines

**List of Experiments**

Sr. No.	Experiment Title
1	Identify the case study and detail statement of problem. Design an Entity Relationship (ER) / Extended Entity-Relationship (EER) Model & Mapping ER/EER to Relational schema.
2	Create a database using Data Definition Language (DDL)

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3	Apply DML commands for the specified system & perform simple queries, string
4	Apply integrity constraints for the specified case study.
5	Program for SQL Commands to implement aggregate functions(SUM, COUNT, AVERAGE, etc)
6	Program for SQL Commands to implement Scalar functions(LEN, UCASE, LCASE, etc)
7	Program for SQL Commands to implement Filter commands(Group By, Having, Where, etc)
8	Program for SQL Commands to implement SET operations(Union, Intersection, etc)
9	Implement various join operations, nested and complex queries.
10	Implementation of views and triggers.
11	Case Study Topic for Special topic Seminar presentation
12	Online/ Offline Certification Course based on SQL, RDBMS or allied topic
13	Design of XML Schema   XML Document
14	Querying an XML Document

**Guidelines for Case Study Topics:**

The case study may be chosen on any relevant topic which needs a database as backend. Suggested case studies but not limited to are as follows:

Sr. No.	Experiment Title
1	Supply Chain Management System
2	Food Delivery Management System
3	Company Database Management System
4	University Database Management System
5	Hospital Management System
6	Student Management System
7	Library Management System
8	Aviation Management System
9	Car Parking Management System
10	Vaccination Program Management System

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**(Draft copy of Programme Scheme and Syllabus (R-2022), Subject to approval of Academic Council, Vidyalankar Institute of Technology)**