

Shree Rahul Education Society's (Regd.)

# SHREE L. R. TIWARI COLLEGE OF ENGINEERING

(Approved by AICTE & DTE, Maharashtra State & Affiliated to University of Mumbai)  
NAAC Accredited, NBA Accredited Program, ISO 9001:2015 Certified | DTE Code No. : 3423  
Minority Status (Hindi Linguistic)

## Programme Outcomes (POs), Programme Specific Outcomes and Course Outcomes

Sr. No.	Content
1	Programme Outcomes (POs)
2	Programme Specific Outcomes for Bachelor of Engineering and Master of Engineering for all departments
3	Course Outcomes for all departments

**PRINCIPAL**  
Shree L. R. Tiwari College of Engineering  
Kanakiya Park, Mira Road (E).







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## Programme Outcome (POs)

Programme Outcomes are the skills and knowledge the students have by the time they graduate. This indicates what a student can do from subject-wise knowledge acquired during the programme.

**PO-1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO-2 Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO-3 Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO-4 Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO-5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

**PO-6 The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO-7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

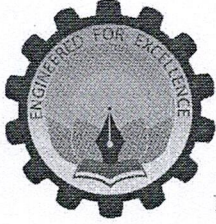
**PO-8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.



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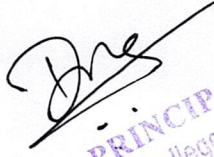
**PO-9 Individual and Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and multidisciplinary settings.

**PO-10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO-11 Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO-12 Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



  
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## Program Specific Outcomes (PSOs)

At the end of the program, the graduate will demonstrate

### Electronics and Telecommunication Engineering: Masters of Engineering

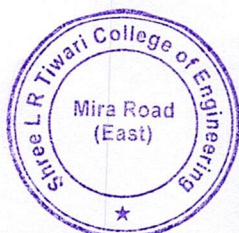
- **PSO1: Professional Skills:** An ability to understand and associate the basic concepts and applications in the field of Electronics, Communication/networking, signal processing, microwave technology, embedded systems and semiconductor technology in the design of complex systems.
- **PSO2: Problem- Solving skills:** A capability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications with cost effective and appropriate solutions.
- **PSO3: Successful career and Social concern:** an understanding of skills to communicate in both oral and written forms to have a successful career, demonstrating the practice of professional ethics and the concerns for societal and environmental well-being by solving real world problems.

### Electronics Engineering: Bachelors of Engineering

- **PSO1:** To apply the knowledge of mathematics, physics, electronics to attain the ability to design and develop hardware and software based system to evaluate and recognize potential risks and provide creative solutions.
- **PSO2:** To develop all round personality with multiple skills like leadership, verbal and written communication, team work, to be sensitive and responsible towards society.
- **PSO3:** Apply the contextual knowledge of Electronics and Computer science engineering to experience an environment conducive in cultivating skills for successful career, entrepreneurship and related studies

### Civil Engineering: Bachelors of Engineering

- **PSO-1** Enhancing skills in a specialized area to apply and analyze realistic problems in one of the following specialized areas of Civil Engineering such as Construction Materials and Management, Structural, Geotechnical, Environmental, water resources and Transportation Engineering.
- **PSO-2** Ability to identify, analyze and apply principles of civil engineering for the entire life cycle of the project ranging from initiation to the closure of the project.



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## Program Specific Outcomes (PSOs)

At the end of the program, the graduate will demonstrate

### Computer Engineering: Bachelors of Engineering

- **PSO-1** The graduate must be able to develop, deploy, test and maintain the software or computing hardware solutions to solve real life problems using state of the art technologies, standards, tools and programming paradigms.
- **PSO-2** The graduate should be able to adapt Computer Engineering knowledge and skills to create career paths in industries or business organizations or institutes of repute.

### Computer Engineering: Masters of Engineering

- **PSO-1** The graduate must be able to develop, deploy, test and maintain the software or computing hardware solutions to solve real life problems using state of the art technologies, standards, tools and programming paradigms.
- **PSO-2** The graduate should be able to adapt Computer Engineering knowledge and skills to create career paths in industries or business organizations or institutes of repute.

### Electronics and Telecommunication Engineering: Bachelors of Engineering

- **PSO1: Professional Skills:** An ability to understand and associate the basic concepts and applications in the field of Electronics, Communication/networking, signal processing, microwave technology, embedded systems and semiconductor technology in the design of complex systems.
- **PSO2: Problem- Solving skills:** A capability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications with cost effective and appropriate solutions.
- **PSO3: Successful career and Social concern:** an understanding of skills to communicate in both oral and written forms to have a successful career, demonstrating the practice of professional ethics and the concerns for societal and environmental well-being by solving real world problems.



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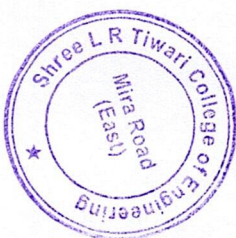
At the end of the program, the graduate will demonstrate

### Mechanical Engineering: Bachelors of Engineering

- **PSO1:** An ability to identify, analyze and solve engineering problems relating to mechanical systems together with allied engineering streams.
- **PSO2:** The Mechanical Engineering Graduates will be able to Work in power plants and manufacturing industry in the sphere of operation and maintenance.
- **PSO3:** The Mechanical Engineering Graduates will be able to function in software industry in the areas of Design and development of software tools such as AUTO CAD, Solid works, Ansys.
- **PSO4:** An ability to build the nation, by imparting technological inputs and managerial skills to become Technocrats and Entrepreneurs, build the attitude of developing new concepts on emerging fields and pursuing advanced education.

### Information Technology: Bachelors of Engineering

- **PSO 1:** Students will be able to apply the knowledge of Information Technology to Define, Analyze, Design, Test, and Integrate subsystems to provide domain-specific IT solutions for real-world problems.
- **PSO 2:** Students will be able to apply innovative tools and techniques in the field of Information Security, Data Analytics, Artificial Intelligence, Cloud Computing, and Information Retrieval.



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EXTC Department

Second Year Academic Year:2020-21 (w.e.f.from 2019-20)

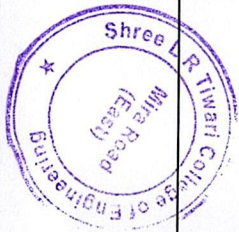
ODD SEM

Course code	Course Name	Course Outcomes
ECC301	Applied Mathematics -III	Understand the concept of Laplace transform and its application to solve the real integrals in Engineering problems.
		Understand the concept of inverse Laplace transform of various functions and its applications in Engineering problems.
		Expand the periodic function by using Fourier series for real life problems and complex Engineering problems.
		Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function.
		Use matrix algebra to solve the engineering problems.
		Apply the concepts of vector calculus in real life problems.
ECC302	Electronic Devices & Circuits-I	Understand the current voltage characteristics of semiconductor devices,
		Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation
		Design and analyze of electronic circuits
		Evaluate frequency response to understand behaviour of Electronics circuits.
ECC303	Digital System Design	Develop a digital logic and apply it to solve real life problems.
		Analyze, design and implement combinational logic circuits.
		Classify different semiconductor memories.
		Analyze, design and implement sequential logic circuits.
		Analyze digital system design using PLD.
		Simulate and implement combinational and sequential circuits using VHDL systems.
ECC304	Network Theory	Apply their knowledge in analyzing Circuits by using network theorems.
		Apply the time and frequency method of analysis.
		Evaluate circuit using graph theory.
		Find the various parameters of two port network.
		Apply network topology for analyzing the circuit.
		Synthesize the network using passive elements.
ECC305	Electronic Instrumentation & Control	Students will be able to explain principle of operation for various sensors.
		Students will be able to describe functional blocks of data acquisition system.
		Students will be able to find transfer functions for given system.
		Students will be able to calculate time domain and frequency domain parameter for given system
		Students will be able to predict stability of given system using appropriate criteria.



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ECL304	Skill Lab :C++ & Java Programming	Describe the basic principles of OOP.
		Design and apply OOP principles for effective programming.
		Develop programming applications using OOP language.
		Implement different programming applications using packaging.
		Analyze the strength of OOP.
ECM301	Mini Project 1A: Analog & Digital Circuit Design based Projects	Percept the Utility and applicability of OOP.
		Create the electronics circuit for particular application/experiment.
		Design and simulate the circuits by putting together the analog and digital components
		Learn the technique of soldering and circuit implementation on general purpose printed circuit board (GPP).
		Realize the PCB design process and gain up-to-date knowledge of PCB design software.
		Utilize the basic electronic tools and equipment's (like DMM, CRO, DSO etc.)
Analysis of hardware fault (Fault detection and correction)		

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Second Year Academic Year:2019-20 (w.e.f.from 2017-18)

EVEN SEM

Course code	Course Name	Course Outcomes
ECC401	Applied Mathematics-IV	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
		Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI.
		Apply the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
		Apply the concept of vector spaces and orthogonalization process in Engineering Problems.
		Use the concept of Quadratic forms and Singular value decomposition which are very useful tools in various Engineering applications.
		Find the extremals of the functional using the concept of Calculus of variation.
ECC402	Electronic Devices & Circuits-II	Understand Computer and its memory System,
		Understand the detailed architecture of 8051 and ARM7 Core.
		Write programs for 8051 microcontrollers.
		Design an applications using microcontroller
ECC403	Linear Integrated Circuits	Outline and classify all types of integrated circuits.
		Understand the fundamentals and areas of applications for the integrated circuits.
		Develop the ability to design practical circuits that perform the desired operations.
		Understand the differences between theoretical & practical results in integrated circuits.
		Identify the appropriate integrated circuit modules for designing engineering application.
ECC404	Signals and Systems	Classify and Analyze different types of signals and systems
		Analyze continuous time LTI signals and systems in transform domain
		Analyze and realize discrete time LTI signals and systems in transform domain
		Represent signals using Fourier Series and Analyze the systems using the Fourier Transform.
		Demonstrate the concepts learnt in Signals and systems Course using the modern engineering tools.
ECC405	Principles of Communication Engineering	Understand the basic components and types of noises in communication systems.
		Analyze the concepts of amplitude modulation and demodulation.
		Analyze the concepts of angle modulation and demodulation.
		Compare the performance of AM and FM receivers.
		Describe analog and digital pulse modulation techniques.

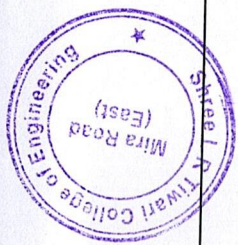


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		Illustrate the principles of multiplexing and demultiplexing techniques.
ECL404	Skill Lab: Python Programming	Describe syntax and semantics in Python
		Illustrate different file handling operations
		Interpret object oriented programming in Python
		Design GUI Applications in Python
		Express proficiency in the handling Python libraries for data science
		Develop machine learning applications using Python
ECM401	Mini-Project 1B: Arduino & Raspberry Pi based Projects	Write basic codes for the Arduino board using the IDE for utilizing the onboard resources.
		Apply the knowledge of interfacing different devices to the Arduino board to accomplish a given task.
		Design Arduino based projects for a given problem.
		Write code using python language using IDE for utilizing the onboard resources.
		Apply the knowledge of interfacing different devices to raspberry Pi board to accomplish a given task.
		Design Raspberry Pi based projects for a given problem.



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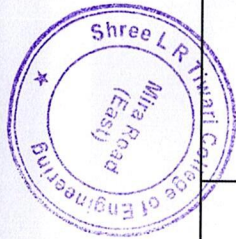


EXTC Department

Third Year Academic Year:2020-21 (w.e.f.from 2018-19)

ODD SEM

Course code	Course Name	Course Outcomes
		Understand the basic concepts of microcomputer systems.
ECC501	Microprocessors & Peripherals	Understand the architecture and software aspects of microprocessor 8086.
		Write Assembly language program in 8086.
		Know the Co-processor configurations.
		Interface peripherals for 8086.
ECC502	Digital Communication	Design elementary aspect of microprocessor based system.
		Understand random variables and random processes of signal,
		Apply the concepts of Information Theory in source coding,
		Evaluate different methods to eliminate Inter-symbol interference
ECC503	Electromagn etic Engineering	Compare different band-pass modulation techniques,
		Evaluate performance of different error control codes.
ECC504	Discrete Time Signal Processing	anisotropic media
		mismatched impedances and tuning
		Understand the concepts of discrete-time Fourier transform and fast Fourier transform
		Apply the knowledge of design of IIR digital filters to meet arbitrary specifications.
ECCDLO 5014	Data Compression & Encryption	Apply the knowledge of design of FIR digital filters to meet arbitrary specifications
		Analyze the effect of hardware limitations on performance of digital filters.
		Apply the knowledge of DSP processors for various applications
		Implement text, audio and video compression techniques
ECL503	Business Communication & Ethics Laboratory	Understand Symmetric and Asymmetric Key Cryptography schemes.
		Understand network security.
		Design a technical document using precise language, suitable vocabulary and apt style.
		Develop the life skills/ interpersonal skills to progress professionally by building stronger relationships.
ECL504	Open Source technology for Communication Lab	Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
		Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.
		Deliver formal presentations effectively implementing the verbal and non-verbal skills.
		Learn open source programming tools for communication technology
		Simulate and analyze the performance of communication system.
		Implement the communication system/subsystem.



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**EXTC Department**

**Final Year Academic Year:2019-20 (w.e.f.from 2019-20)**

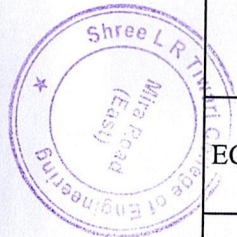
**ODD SEM**

Course code	Course Name	Course Outcomes
ECC701	Microwave Engineering	Characterize devices at higher frequencies.
		Design and analyze microwave circuits.
		Design and analyze amplifiers and oscillators at microwave frequencies.
		Demonstrate skills of planning, design and deployment of microwave networks.
ECC702	Mobile Communication System	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems
		Classify different types of propagation models and analyze the link budget
		Illustrate the fundamentals and system architecture of GSM, 2.5G and IS-95.
		Apply the concepts of 3G technologies of UMTS and CDMA 2000
		Elaborate the principles of 3GPP LTE.
ECC703	Optical Communication	List, write and explain fundamentals and transmission characteristics of optical fiber Communication. components
		Calculate parameters for optical link budgeting and analyze the link
ECCDLO 7031	Neural networks & Fuzzy Logic	Comprehend the concepts of biological neurons and artificial neurons
		Analyze the feed-forward and feedback neural networks and their learning algorithms
		Calculate Comprehend the neural network training and design concepts
		Analyze the application of neural networks to non linear real world problem
		Comprehend the concept of fuzziness involved in various systems, fuzzy set theory and fuzzy logic
ECCILO 7016	Cyber Security and Laws	Apply fuzzy logic to real world problems.
		Understand the concept of cybercrime and its effect on outside world
		Interpret and apply IT law in various legal issues
		Distinguish different aspects of cyber law
		Apply Information Security Standards compliance during software design and development

**Final Year Academic Year:2019-20 (w.e.f.from 2019-20)**

**EVEN SEM**

Course code	Course Name	Course Outcomes
		Design impedance matching networks and passive RF filters.



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**EVEN SEM**

Course code	Course Name	Course Outcomes
ECC601	Microcontrollers & Applications	Understand the detailed architecture of 8051 and ARM7 microcontroller.
		Study the in-depth working of the microcontrollers and their Instruction set.
		Interface various peripheral devices to the microcontrollers.
		Write Assembly language and Embedded C program for microcontrollers.
ECC602	Computer Communication Networks	devices that meets a customer's specific needs.
		Perform basic configurations on routers and Ethernet switches.
		Demonstrate knowledge of programming for network communications
		Learn to simulate computer networks and analyse the simulation results
		Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model.
ECC603	Antenna & Radio Wave Propagation	Define Basic antenna parameters like radiation pattern, directivity and gain
		Define Basic antenna parameters like radiation pattern, directivity and gain
		Design of uniform linear and planar antenna arrays using isotropic and directional Sources.
		Implement special types of Antennas like microstrip antennas and reflectors.
ECC604	Image Processing & Machine Vision	Understand theory and models in image processing.
		Interpret and analyze 2D signals in Spatial and frequency domain through image transforms
		Apply quantitative models of image processing for segmentation and restoration for various applications.
		methods.
ECCDLO 6022	Radar Engineering	Explain generalized concept of RADAR
		Solve problems using radar equations.
		Describe different types of radar for specific application.
		Explain concept of tracking radar.
		Evaluate the design constraints for transmitter
Evaluate the design constraints for receiver.		
ECCDLO 6023	Database Management System	Understand the different issues involved in the design and implementation of a database system.
		Transform an information model into a relational database schema and to use a data definition language and/or utility to implement the schema using a DBMS.
		Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
		Understand the concepts of constraints, views, concurrency control, deadlock



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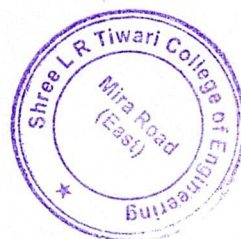


ECC801	RF Design	Design and appraise RF amplifiers and oscillators
		Analyze EMI and EMC in RF circuits.
ECC802	Wireless Networks	Explain the working of different wireless technologies like bluetooth and zigbee.
		Understand the working of wireless LAN, PAN & MAN
		Analyze the different types of Wireless Networks like LAN,PAN & MAN
		Comprehend the working of Femtocells.
ECCDLO 8043	Satellite Communication	Explain basics of satellite communication, space segment and earth segment
		Understand different satellite orbits and orbital parameters
		Explain and analyze link budget of satellite signal for proper communication
		Understand various applications of satellite communications
ECCILO 8029	Environmental Management	Understand the concept of environmental management
		Understand ecosystem and interdependence, food chain etc
		Understand and interpret environment related legislations



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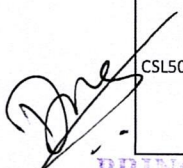
CMPN department		
Second Year(SE) SEM 3 Academic Year:2019-2020 (Revised course 2016)		
Course code	Course Name	Course Outcomes
CSC301	Applied Mathematics - III	CSC301.1 Understand the basic knowledge of Laplace Transform CSC301.2 understand the concept of inverse laplace transform of various functions and its applications in solving differential equations CSC301.3 Understand the periodic function by Fourier series and complex form of fourier series and Fourier Transforms. CSC301.4 understand the concept of vector algebra and vector differentiation CSC301.5 understand the concept of vector integral in Green's theorem,Stoke's theorem. CSC301.6 Understand complex variables theory ,applications of harmonic conjugate to get orthogonal
CSC302	Digital Logic Design and Analysis	CSC304.1. To study and compare different number systems and their conversions. CSC304.2. To analyze and minimize Boolean expressions. CSC304.3. To design and implement combinational circuits and sequential circuits CSC304.4. To understand the basic concepts of VHDL,TTL and CMOS Logic families.
CSC303	Discrete Mathematics	CSC303.1. Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving CSC303.2. Ability to reason logically. CSC303.3. Ability to understand relations, Digraph and lattice. CSC303.4. Ability to understand use of functions, graphs and their use in programming applications. CSC303. 5. Understand use of groups and codes in Encoding-Decoding verification, artificial intelligence, cryptography, Data Analysis and Data Mining etc.
CSC304	Electronic Circuits and Communication Fundamentals	CSC304.1. To develop the knowledge of semiconductor devices and circuits, and explain their use in communication applications. CSC304.2. To inculcate circuit analysis capabilities in students. CSC304.3. To gain knowledge in electronic devices and circuits that is useful in real life applications. CSC304.4. To understand the fundamental concepts of electronic communication and their use in computer applications.
CSC305	Data Structures	CSC305.1. To teach various storage mechanisms of data. CSC305.2. To design and implement various data structures. CSC305.3. To introduce various techniques for representation of the data in the real world. CSC305.4. To teach different sorting techniques. CSC305.5. To teach different searching techniques.
CSL304	OOPM(Java) Lab	CSL304.1. To learn the object oriented programming concepts. CSL304.2. To study various java programming concept like multithreading, exception handling, packages etc. CSL304.3. To explain components of GUI based programming.
CSL301	Digital System Lab	1. Understand the basics of various digital components. 2. Understand the principles of design of combinational logic and sequential logic circuits using basic components. 3. Recognize the importance of digital systems in computer architecture. 4. Design and simulate the basic digital circuit.
CSL302	Basic Electronics Lab	1. Understand the basics of various semiconductor devices, electronic components and instruments. 2. Understand the working of electronic circuits using components 3. Recognize the importance of electronic circuits in electronic communications. 4. Study the fundamental concepts of various modulation methods.
CSL303	Data Structures Lab	1. Students will be able to implement various linear and nonlinear data structures. 2. Students will be able to handle operations like insertion, deletion, searching and traversing on various data structures.
Second Year(SE) SEM 4 Academic Year:2019-2020 (Revised course 2016)		
Course code	Course Name	Course Outcomes
CSC401	Applied Mathematics IV	1. Students in this course will be able to apply the method of solving complex integration, computing residues & evaluate various contour integrals. 2. Demonstrate ability to manipulate matrices and compute Eigen values and Eigen vectors. 3. Apply the concept of probability distribution to the engineering problems. 4. Apply the concept of sampling theory to the engineering problems. 5. Use matrix algebra with its specific rules to solve the system of linear equation, using concept of Eigen value and Eigen vector to the engineering problems. 6. Apply the concept of Linear & Non-Linear Programming Problem to the engineering problems
CSC402	Analysis of Algorithms	1. Analyze the running time and space complexity of algorithms. 2. Describe, apply and analyze the complexity of divide and conquer strategy. 3. Describe, apply and analyze the complexity of greedy strategy. 4. Describe, apply and analyze the complexity of dynamic programming strategy. 5. Explain and apply backtracking, branch and bound and string matching techniques to deal with some hard problems. 6. Describe the classes P, NP, and NP-Complete and be able to prove that a certain problem is NP-Complete.
CSC403	Computer Organization and Architecture	2. To demonstrate the arithmetic algorithms for solving ALU operations. 3. To describe instruction level parallelism and hazards in typical processor pipelines. 4. To describe superscalar architectures, multi-core architecture and their advantages 5. To demonstrate the memory mapping techniques. 6. To identify various types of buses, interrupts and I/O operations in a computer system
		1. Understand the basic concepts of Computer Graphics. 2. Demonstrate various algorithms for scan conversion and filling of basic objects and their



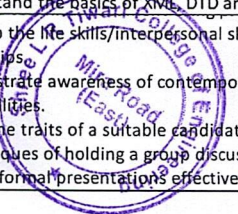
CSL403	Processor Architecture Lab	<ol style="list-style-type: none"> <li>1. Assemble personal computer</li> <li>2. Design the basic building blocks of a computer: arithmetic-logic unit, registers, central processing unit, and memory.</li> <li>3. Implement various algorithms like Booth's algorithm for arithmetic operations</li> <li>4. Describe various I/O buses with merits and demerits.</li> </ol>
CSL404	Operating System Lab	<ol style="list-style-type: none"> <li>1. Understand basic operating system commands.</li> <li>2. Understand and explore various system calls.</li> <li>3. Write shell scripts and shell commands using kernel APIs.</li> <li>4. Implement and analyze different process scheduling algorithms</li> <li>5. Implement and analyze different memory management algorithms.</li> <li>6. Evaluate process management techniques and deadlock handling using simulator.</li> </ol>
CSL405	Open Source Technology Lab	<ol style="list-style-type: none"> <li>1. To understand basic concepts in python and perl.</li> <li>2. To explore contents of files, directories and text processing with python</li> <li>3. To develop program for data structure using built in functions in python.</li> <li>4. To explore django web framework for developing python based web application.</li> <li>5. To understand file handling and database handling using perl.</li> <li>6. To explore basics of two way communication between client and server using python and perl</li> </ol>

**Third Year(TE) SEM 5 Academic Year:2019-2020 (Revised course 2016) ODD**

Course code	Course Name	Course Outcomes
CSC501	Microprocessor	<ol style="list-style-type: none"> <li>1. Describe architecture of x86 processors.</li> <li>2. Interpret the instructions of 8086 and write assembly and Mixed language programs.</li> <li>3. Explain the concept of interrupts</li> <li>4. Identify the specifications of peripheral chip</li> <li>5. Understand the requirements of a database systems</li> </ol>
CSC502	Database Management System	<ol style="list-style-type: none"> <li>2. Design and draw ER and EER diagram for the real life problem.</li> <li>3. Convert conceptual model to relational model and formulate relational algebra queries.</li> <li>4. Design and querying database using SQL.</li> <li>5. Analyze and apply concepts of normalization to relational database design.</li> </ol>
CSC503	Computer Network	<ol style="list-style-type: none"> <li>1. Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.</li> <li>2. Demonstrate the knowledge of networking protocols at data link layer.</li> <li>3. Design the network using IP addressing and subnetting / supernetting schemes.</li> <li>4. Analyze various routing algorithms and protocols at network layer.</li> <li>5. Analyze transport layer protocols and congestion control algorithms.</li> <li>6. Explore protocols at application layer .</li> </ol>
CSC504	Theory of Computer Science	<ol style="list-style-type: none"> <li>1. Identify the central concepts in theory of computation and differentiate between deterministic and nondeterministic automata, also obtain equivalence of NFA and DFA.</li> <li>2. Infer the equivalence of languages described by finite automata and regular expressions.</li> <li>3. Devise regular, context free grammars while recognizing the strings and tokens.</li> <li>4. Design pushdown automata to recognize the language.</li> <li>5. Develop an understanding of computation through Turing Machine.</li> <li>6. Acquire fundamental understanding of decidability and undecidability.</li> </ol>
CSDL05011	Multimedia System	<ol style="list-style-type: none"> <li>2. To understand different multimedia components.</li> <li>3. To explain file formats for different multimedia components.</li> <li>4. To analyze the different compression algorithms.</li> <li>5. To describe various multimedia communication techniques.</li> </ol>
CSL501	Microprocessor Lab	<ol style="list-style-type: none"> <li>1. Use appropriate instructions to program microprocessor to perform various task</li> <li>2. Develop the program in assembly/ mixed language for Intel 8086 processor</li> <li>3. Demonstrate the execution and debugging of assembly/ mixed language program</li> </ol>
CSL502	Computer Network Lab	<ol style="list-style-type: none"> <li>1. Design and setup networking environment in Linux.</li> <li>2. Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols.</li> <li>3. Implement programs using core programming APIs for understanding networking concepts</li> </ol>
CSL503	Database & Information System Lab	<ol style="list-style-type: none"> <li>2. Create and update database and tables with different DDL and DML statements.</li> <li>3. Apply /Add integrity constraints and able to provide security to data.</li> <li>4. Implement and execute Complex queries.</li> <li>5. Apply triggers and procedures for specific module/task</li> <li>6. Handle concurrent transactions and able to access data through front end (using JDBC ODBC connectivity.)</li> </ol>
CSL504	Web Design Lab	<ol style="list-style-type: none"> <li>2. Design static web pages using HTML5 and CSS3</li> <li>3. Apply the concept of client side validation and design dynamic web pages using JavaScript and JQuery.</li> <li>4. Evaluate client and server side technologies and create Interactive web pages using PHP , AJAX with database connectivity using MySQL.</li> <li>5. Understand the basics of XML, DTD and XSL and develop web pages using XML / XSLT.</li> </ol>
CSL505	Business Communication & Ethics	<ol style="list-style-type: none"> <li>2. Develop the life skills/interpersonal skills to progress professionally by building stronger relationships.</li> <li>3. Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.</li> <li>4. Apply the traits of a suitable candidate for a job/higher education , upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.</li> <li>5. Deliver formal presentations effectively implementing the verbal and non-verbal skills</li> </ol>



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Course code	Course Name	Course Outcomes
CSC601	Software Engineering	<ol style="list-style-type: none"> <li>1. Understand and demonstrate basic knowledge in software engineering.</li> <li>2. Identify requirements, analyze and prepare models.</li> <li>3. Plan, schedule and track the progress of the projects.</li> <li>4. Design &amp; develop the software projects.</li> <li>5. Identify risks, manage the change to assure quality in software projects.</li> <li>6. Apply testing principles on software project and understand the maintenance concepts.</li> </ol>
CSC602	System Programming And Compiler Construction	<ol style="list-style-type: none"> <li>1. Identify the relevance of different system programs.</li> <li>2. Describe the various data structures and passes of assembler design.</li> <li>3. Identify the need for different features and designing of macros.</li> <li>4. Distinguish different loaders and linkers and their contribution in developing efficient user applications.</li> <li>5. Construct different parsers for given context free grammars.</li> <li>6. Justify the need synthesis phase to produce object code optimized in terms of high execution speed.</li> </ol>
CSC603	Data Warehousing and Mining	<ol style="list-style-type: none"> <li>1. Understand data warehouse fundamentals, data mining principles</li> <li>2. Design data warehouse with dimensional modelling and apply OLAP operations.</li> <li>3. Identify appropriate data mining algorithms to solve real world problems</li> <li>4. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining</li> <li>5. Describe complex data types with respect to spatial and web mining.</li> <li>6. Benefit the user experiences towards research and innovation.</li> </ol>
CSC604	Cryptography and System Security	<ol style="list-style-type: none"> <li>1. Understand system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory.</li> <li>2. Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication</li> <li>3. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.</li> <li>4. Apply different digital signature algorithms to achieve authentication and design secure applications</li> <li>5. Understand network security basics, analyze different attacks on networks and evaluate the</li> </ol>
CSDLO 6022	Advanced Database Management System	<ol style="list-style-type: none"> <li>1. Build indexing mechanisms for efficient retrieval of information from databases.</li> <li>2. Measure query cost and optimize query execution</li> <li>3. Design distributed database for better resource management</li> <li>4. Demonstrate the understanding of the concepts of document oriented databases.</li> <li>5. Apply appropriate security techniques database systems.</li> <li>6. Implement advanced data models for real life applications.</li> </ol>
CSL601	Software Engineering Lab	<ol style="list-style-type: none"> <li>1. Identify requirements and apply process model to selected case study.</li> <li>2. Analyze and design models for the selected case study using UML modeling.</li> <li>3. Use various software engineering tools.</li> </ol>
CSL602	System Software Lab	<ol style="list-style-type: none"> <li>1. Generate machine code by using various databases generated in pass one of two pass assembler.</li> <li>2. Construct different databases of single pass macro processor.</li> <li>3. Identify and validate different tokens for given high level language code.</li> <li>4. Parse the given input string by constructing Top down /Bottom up parser.</li> <li>5. Implement synthesis phase of compiler with code optimization techniques.</li> <li>6. Explore various tools like LEX and YACC.</li> </ol>
CSL603	Data Warehousing and Mining Lab	<ol style="list-style-type: none"> <li>1. Design data warehouse and perform various OLAP operations.</li> <li>2. Implement classification, prediction and association rule mining algorithms.</li> <li>3. Demonstrate classifications, prediction, clustering and association rule mining algorithms on a given set of data sample using data mining tools.</li> <li>4. Implement spatial and web mining algorithms.</li> </ol>
CSL604	System Security Lab	<ol style="list-style-type: none"> <li>1. To be able to apply the knowledge of symmetric cryptography to implement simple ciphers.</li> <li>2. To be able to analyze and implement public key algorithms like RSA and El Gamal.</li> <li>3. To analyze and evaluate performance of hashing algorithms.</li> <li>4. To explore the different network reconnaissance tools to gather information about networks.</li> <li>5. To explore and use tools like sniffers, port scanners and other related tools for analysing packets in a network</li> </ol>
CSM605	Mini project	<ol style="list-style-type: none"> <li>2. Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach</li> <li>3. Contribute as an individual or in a team in development of technical projects.</li> <li>4. Develop effective communication skills for presentation of project related activities.</li> </ol>

**Final Year(BE) SEM 7 Academic Year:2019-2020(Revised course 2016) ODD Semester**

Course code	Course Name	Course Outcomes
CSC701	Digital Signal & Image Processing	<ol style="list-style-type: none"> <li>1. Apply the concept of DT Signal and DT Systems.</li> <li>2. Classify and analyze discrete time signals and systems</li> <li>3. Implement Digital Signal Transform techniques DFT and FFT.</li> <li>4. Use the enhancement techniques for digital Image Processing</li> <li>5. Differentiate between the advantages and disadvantages of different edge detection techniques</li> <li>6. Develop small projects of 1-D and 2-D Digital Signal Processing</li> </ol>
CSC702	Mobile Communication & Computing	<ol style="list-style-type: none"> <li>1. To identify basic concepts and principles in mobile communication &amp; computing, cellular architecture.</li> <li>2. To describe the components and functioning of mobile networking.</li> <li>3. To classify variety of security techniques in mobile network.</li> <li>4. To apply the concepts of WLAN for local as well as remote applications.</li> <li>5. To describe and apply the concepts of mobility management</li> <li>6. To describe Long Term Evolution (LTE) architecture and its interfaces.</li> </ol>



ILO 7013	Management Information System	<p>2. Explain how information systems transform business</p> <p>2. Identify the impact information systems have on an organization</p> <p>3. Describe IT infrastructure and its components and its current trends</p> <p>4. Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making</p> <p>5. Identify the types of systems used for enterprise-wide knowledge management and how they</p>
CSL701	Digital Signal and Image Processing Lab	<p>1. Sample and reconstruct the signal.</p> <p>2. Implement and apply operations like Convolution, Correlation, DFT and FFT on DT signals</p> <p>3. Implement spatial domain Image enhancement techniques.</p> <p>4. Implement Edge detection techniques using first order derivative filters.</p>
CSL702	Mobile Application Development Lab	<p>1. To develop and demonstrate mobile applications using various tools</p> <p>2. Students will articulate the knowledge of GSM, CDMA &amp; Bluetooth technologies and demonstrate it.</p> <p>3. Students will able to carry out simulation of frequency reuse , hidden terminal problem</p> <p>4. To develop security algorithms for mobile communication network</p> <p>5. To demonstrate simulation and compare the performance of Wireless LAN</p> <p>6. To implement and demonstrate mobile node discovery and route maintains</p>
CSL703	Artificial Intelligence & Soft Computing Lab	<p>1 To realize the basic techniques to build intelligent systems</p> <p>2 To create knowledge base and apply appropriate search techniques used in problem solving.</p> <p>3 Apply the supervised/unsupervised learning algorithm.</p> <p>4 Designfuzzy controller system</p>
CSL704	Computational Lab-I	<p>1. Acquire practical knowledge within the chosen area of technology for project development.</p> <p>2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.</p>
CSL705	Major Project- I	<p>The Project work enables students to develop further skills and knowledge gained during the programme by applying them to the analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period. For students to demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data and</p>
<b>Final Year(BE) SEM 8 Academic Year:2019-2020 (Revised course 2016) EVEN Semester</b>		



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Course Code	Course Name	Course Outcomes
CSC801	Human Machine Interaction	<ol style="list-style-type: none"> <li>1. Identify User Interface (UI) design principles.</li> <li>2. Analysis of effective user friendly interfaces.</li> <li>3. Apply Interactive Design process in real world applications.</li> <li>4. Evaluate UI design and justify.</li> <li>5. Create application for social and technical task.</li> </ol>
CSC802	Distributed Computing	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge of the basic elements and concepts related to distributed system technologies;</li> <li>2. Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.</li> <li>3. Analyze the various techniques used for clock synchronization and mutual exclusion</li> <li>4. Demonstrate the concepts of Resource and Process management and synchronization algorithms</li> <li>5. Demonstrate the concepts of Consistency and Replication Management</li> <li>6. Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications</li> </ol>
DLO8012	Natural Language Processing	<ol style="list-style-type: none"> <li>1. Have a broad understanding of the field of natural language processing.</li> <li>2. Have a sense of the capabilities and limitations of current natural language technologies,</li> <li>3. Be able to model linguistic phenomena with formal grammars.</li> <li>4. Be able to Design, implement and test algorithms for NLP problems</li> <li>5. Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP</li> <li>6. Be able to apply NLP techniques to design real world NLP applications such as machine translation, text</li> </ol>
ILO 8021	Project Management	<ol style="list-style-type: none"> <li>1. Apply selection criteria and select an appropriate project from different options.</li> <li>2. Write work break down structure for a project and develop a schedule based on it.</li> <li>3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.</li> <li>4. Use Earned value technique and determine &amp; predict status of the project.</li> <li>5. Capture lessons learned during project phases and document them for future reference</li> </ol>
CSL801	Human Machine Interactions Lab	<ol style="list-style-type: none"> <li>1: To design user centric interfaces.</li> <li>2: To design innovative and user friendly interfaces.</li> <li>3: To apply HMI in their day-to-day activities.</li> <li>4: To criticize existing interface designs, and improve them.</li> <li>5: To Design application for social Task.</li> <li>6: To Design application for Technical Tasks</li> </ol>
CSL802	Distributed Computing Lab	<ol style="list-style-type: none"> <li>1. Develop, test and debug RPC/RMI based client-server programs.</li> <li>2. Implement the main underlying components of distributed systems (such as IPC, name resolution, file systems etc.)</li> <li>3. Implement various techniques of synchronization.</li> <li>4. Design and implement application programs on distributed systems.</li> </ol>
CSL803	Cloud Computing Lab	<ol style="list-style-type: none"> <li>1. Adapt different types of virtualization and increase resource utilization.</li> <li>2. Build a private cloud using open source technologies.</li> <li>3. Analyze security issues on cloud.</li> <li>4. Develop real world web applications and deploy on commercial cloud.</li> <li>5. Demonstrate various service models</li> </ol>
CSL804	Computational Lab II	<ol style="list-style-type: none"> <li>1. Acquire practical knowledge within the chosen area of technology for project development.</li> <li>2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach</li> </ol>
CSP805	Major Project- II	<p>The primary objective is to meet the milestones formed in the overall project plan decided in Project - I. The idea presented in Project -I should be implemented in Project -II with results, conclusion and future work. The project will culminate in the production of a thesis by each individual student.</p>



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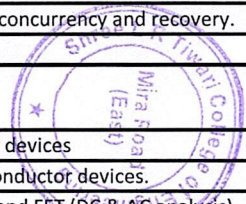
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## Electronics and Computer Science Department

### Semester/ Subject Wise COS

<b>Course Code &amp; Name</b>	ECC 301 Engineering Maths III
<b>CO Number</b>	<b>CO Statement</b>
EEC 301.1	Understand the concept of Laplace transform and its application to solve the real integrals in engineering problems.
EEC 301.2	Understand the concept of inverse Laplace transform of various functions and its applications in engineering problems.
EEC 301.3	Expand the periodic function by using Fourier series for real life problems and complex engineering problems.
EEC 301.4	Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function.
EEC 301.5	Use matrix algebra to solve the engineering problems.
EEC 301.6	Apply the concepts of vector calculus in real life problems.
<b>Course Code &amp; Name</b>	ECC 302 Electronic Devices
EEC 302.1	Explain the working of semiconductor devices.
EEC 302.2	Interpret the characteristics of semiconductor devices.
EEC 302.3	Analyse Electronics circuits using BJT and FET (DC & AC analysis).
EEC 302.4	Compare various biasing circuits & configurations of BJT and MOSFETs.
EEC 302.5	Select best circuit for the given specifications/application.
EEC 302.6	Describe the working of advanced nanoelectronic devices.
<b>Course Code &amp; Name</b>	ECC 303 Digital Electronics
EEC 303.1	Perform code conversion and able to apply Boolean algebra for the implementation and minimisation of logic functions.
EEC 303.2	Analyse, design and implement Combinational logic circuits.
EEC 303.3	Analyse, design and implement Sequential logic circuits.
EEC 303.4	Design and implement various counter using flip flops and MSI chips.
EEC 303.5	Understand TTL & CMOS logic families, PLDs, CPLD and FPGA.
EEC 303.6	Understand basics of Verilog Hardware Description Language and its programming with combinational and sequential logic circuits.
<b>Course Code &amp; Name</b>	ECC 304 Data Structures and Algorithms
ECC 304.1	Implement various linear data structures.
ECC 304.2	Implement various non linear data structures.
ECC 304.3	Select appropriate sorting and searching techniques for a given problem and use it.
ECC 304.4	Develop solutions for real world problems by selecting appropriate data structure and algorithms.
ECC 304.5	Analyse the complexity of the given algorithms.
<b>Course Code &amp; Name</b>	ECC 305 Database Management Systems
ECC 305.1	Recognize the need of database management system
ECC 305.2	Design ER and EER diagram for real life applications
ECC 305.3	Construct relational model and write relational algebra queries
ECC 305.4	Formulate SQL queries
ECC 305.5	Apply the concept of normalization to relational database design
ECC 305.6	Describe the concepts of transaction, concurrency and recovery.
<b>Course Code &amp; Name</b>	ECL 301 Electronic Devices Lab -
ECL 301.1	Explain the working of semiconductor devices
ECL 301.2	Interpret the characteristics of semiconductor devices.
ECL 301.3	Analyse electronics circuits using BJT and FET (DC & AC analysis)
ECL 301.4	Simulate basic circuits using electronic devices through software simulation
<b>Course Code &amp; Name</b>	ECL 302 Digital Electronics Lab
ECL 302.1	Perform code conversion and able to apply Boolean algebra for the implementation and minimisation of logic functions.



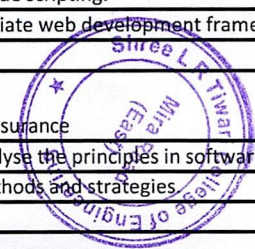


<b>Course Code &amp; Name</b>	ECL 305 Skill-based Lab OOPM (C++ and Java)
ECL 305.1	Use C++ in programming.
ECL 305.2	Use different control structures.
ECL 305.3	Understand fundamental features of an object-oriented language: object classes and interfaces, exceptions and library
ECL 305.4	Understand Java Programming.
ECL 305.5	To develop a program that efficiently implements the features and packaging concept of java in laboratory.
ECL 305.6	To implement Exception Handling and Applets using Java.
<b>Course Code &amp; Name</b>	ECM 301 Mini Project- 1A
ECM 301.1	Identify problems based on societal /research needs.
ECM 301.2	Apply Knowledge and skill to solve societal problems in a group.
ECM 301.3	Develop interpersonal skills to work as member of a group or leader
ECM 301.4	Draw the proper inferences from available results through theoretical/ experimental/simulations
ECM 301.5	Analyse the impact of solutions in societal and environmental context for sustainable development
ECM 301.6	Use standard norms of engineering practices
ECM 301.7	Excel in written and oral communication
ECM 301.8	Demonstrate capabilities of self-learning in a group, which leads to life-long learning.
ECM 301.9	Demonstrate project management principles during project work.
<b>Course Code &amp; Name</b>	ECC 401 Engineering Maths IV
ECC 401.1	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour inte
ECC 401.2	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI
ECC 401.3	Apply the concepts of probability and expectation for getting the spread of the data and distribution of probabilities
ECC 401.4	Apply the concept of vector spaces and orthogonalization process in Engineering Problems
ECC 401.5	Use the concept of Quadratic forms and Singular value decomposition which are very useful tools in various Engineeri
ECC 401.6	Find the extremals of the functional using the concept of Calculus of variation.
<b>Course Code &amp; Name</b>	ECC 402 Electronic Circuits
ECC 402.1	Evaluate the performance of amplifiers through frequency response.
ECC 402.2	Analyse differential amplifiers for various performance parameters
ECC 402.3	Express mathematically the performance parameters in terms of circuit parameters
ECC 402.4	Choose appropriate circuit for the given specifications/ applications
ECC 402.5	Describe various applications and circuits based on operational amplifiers.
ECC 402.6	Design an application with the use of integrated circuits.
<b>Course Code &amp; Name</b>	ECC 403 Controls and Instrumentation
ECC 403.1	Derive the transfer functions for the given control systems
ECC 403.2	Analyse the performance of control systems based on the time domain and frequency domain specifications
ECC 403.3	Judge the stability of the given control systems using appropriate stability criteria.
ECC 403.4	Understand and explain the working principle of sensors and transducers.
ECC 403.5	Explain various parameters of data acquisition systems.
ECC 403.6	Describe instrument communication standards.
<b>Course Code &amp; Name</b>	ECC 404 Microprocessors and Microcontrollers
ECC 404.1	Explain 16-bit Microprocessor architectures and fundamental concepts of Microcontrollers
ECC 404.2	To develop programming skills for Microprocessors and Microcontrollers
ECC 404.3	To interface various devices in Microprocessor and Microcontroller systems
ECC 404.4	To design and implement Microprocessor and Microcontroller based systems.
<b>Course Code &amp; Name</b>	ECC 405 Discrete Structures and Automata Theory
ECC 405.1	Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving
ECC 405.2	Reason Logically
ECC 405.3	Perform operations with Sets, Relations, Functions, Graphs and their applications.
ECC 405.4	Design Deterministic Finite Automata (DFA) and Non-deterministic Finite Automata (NFA) and Pushdown Automata w



<b>Course Code &amp; Name</b>	ECL404 Skill-Based Lab: Python Programming
ECL 404.1	Describe syntax and semantics in Python
ECL 404.2	Illustrate different file handling operations
ECL 404.3	Interpret object-oriented programming in Python
ECL 404.4	Design GUI Applications in Python
ECL 404.5	Express proficiency in the handling Python libraries for data science
ECL 404.6	Develop machine learning applications using Python
<b>Course Code &amp; Name</b>	ECM 401 Mini Project-1B
ECM 401.1	Identify problems based on societal /research needs
ECM 401.2	Apply Knowledge and skill to solve societal problems in a group
ECM 401.3	Develop interpersonal skills to work as member of a group or leader
ECM 401.4	Draw the proper inferences from available results through theoretical/ experimental/simulations
ECM 401.5	Analyse the impact of solutions in societal and environmental context for sustainable development.
ECM 401.6	Use standard norms of engineering practices
ECM 401.7	Excel in written and oral communication
ECM 401.8	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
ECM 401.9	Demonstrate project management principles during project work.
<b>Course Code &amp; Name</b>	ECC 501 Communication Engineering
ECC 501.1	Analyse various analog modulation methods
ECC 501.2	Explain various pulse modulation techniques.
ECC 501.3	Evaluate the impact of Inter Symbol Interference in Baseband transmission and methods to mitigate its effect
ECC 501.4	Compare various Digital modulation methods based on spectral efficiency, Euclidean distance etc
ECC 501.5	Analyse the characteristics of radio receivers
<b>Course Code &amp; Name</b>	ECC 502 Computer Organization and Architecture
ECC 502.1	To introduce the learner to the design aspects which can lead to maximized performance of a Computer
ECC 502.2	To introduce basic concepts and functions of operating systems
ECC 502.3	To understand the concepts of process synchronization and deadlock.
ECC 502.4	To understand various Memory, I/O and File management techniques
ECC 502.5	To introduce the learner to various concepts related to Parallel Processing
ECC 502.6	To highlight the various architectural enhancements in modern processors.
<b>Course Code &amp; Name</b>	ECC 503 Software Engineering
ECC 503.1	Apply software engineering concept and choose process models for a software project development.
ECC 503.2	Analyse and specify software requirement specification (SRS) for software system
ECC 503.3	Convert requirement model into the design model and demonstrate the use of software and userinterface design prin
ECC 503.4	Generate the project schedule and estimate the cost of software system.
ECC 503.5	Identify risks and prepare RMMM plan for quality software system
ECC 503.6	Apply testing strategies and tactics for software system.
<b>Course Code &amp; Name</b>	ECC504 Web Technologies
ECC 504.1	Design static web pages using HTML5.
ECC 504.2	Design the layout of web pages using CSS3
ECC 504.3	Apply the concepts of client-side validation and scripts to static web pages using JavaScript and JQuery.
ECC 504.4	Build responsive web pages using front-end framework Bootstrap
ECC 504.5	Build dynamic web pages using server -side scripting.
ECC 504.6	Develop a web application using appropriate web development framework
<b>Course Code &amp; Name</b>	ECCDO501 Software Testing & Quality Assurance
ECCDO501.1	Investigate the reason for bugs and analyse the principles in software testing to prevent and remove bugs.
ECCDO501.2	Understand various software testing methods and strategies
ECCDO501.3	Design test planning
ECCDO501.4	Manage the test process
ECCDO501.5	Apply the software testing techniques in the commercial equipment

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College of Engineering  
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Bangalore





<b>Course Code &amp; Name</b>	ECL502 Software Engineering and Web Technologies Lab
ECL 502.1	Identify requirements and apply process model to selected case study.
ECL 502.2	Analyse and design models for the selected case study using UML modelling
ECL 502.3	Use various Software Engineering and Project Management Tools
ECL 502.4	Design static web pages using HTML5, CSS3, Bootstrap
ECL 502.5	Apply the concepts of Client-side validation and scripts to static web pages using JavaScript and JQuery
ECL 502.6	Build dynamic web pages using Server-Side Scripting.
<b>Course Code &amp; Name</b>	ECL 503 Software Testing & Quality Assurance Lab
ECL 503.1	Understand the system thoroughly (for requirement, designing and implementation).
ECL 503.2	Recognize failures in the system.
ECL 503.3	Investigate the reason for bugs.
ECL 503.4	. Design test plan and test cases
ECL 503.5	Execute the test cases manually and using automated tools
ECL 503.6	Manage the testing process.
<b>Course Code &amp; Name</b>	ECL 503 Information Theory and Coding -
ECL 503.1	Understand the basics of information theory, source coding techniques and calculate Entropy of source
ECL 503.2	Implement Shannon-Hartley equation to find the upper limit on the Channel Capacity
ECL 503.3	Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise perform
ECL 503.4	Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic code and convol
ECL 503.5	Implement audio and video compression techniques
<b>Course Code &amp; Name</b>	ECM501 Mini project - 2A
ECM 501.1	Identify problems based on societal /research needs
ECM 501.2	Apply knowledge and skill to solve societal problems in a group
ECM 501.3	Develop interpersonal skills to work as member of a group or leader
ECM 501.4	Draw the proper inferences from available results through theoretical/experimental/simulations.
ECM 501.5	Analyze the impact of solutions in societal and environmental context for sustainable development
ECM 501.6	Use standard norms of engineering practices
ECM 501.7	Excel in written and oral communication
ECM 501.8	Demonstrate capabilities of self-learning in a group, which leads to life-long learning
ECM 501.9	Demonstrate project management principles during project work.
<b>Course Code &amp; Name</b>	ECC 601 Embedded Systems and RTOS
ECC 601.1	Identify and describe various characteristic features and applications of Embedded systems.
ECC 601.2	Analyse and select hardware for Embedded system implementation.
ECC 601.3	Evaluate various communication protocols for Embedded system implementation.
ECC 601.4	Compare GPOS and RTOS and investigate the concepts of RTOS.
ECC 601.5	Evaluate and use various tools for testing and debugging embedded systems
ECC 601.6	Design a system for different requirements based on life-cycle for the embedded system, keeping oneself aware of etl
<b>Course Code &amp; Name</b>	ECC602 Artificial Intelligence
ECC602.1	Identify the characteristics of the environment and differentiate between various agent architectures.
ECC602.2	Apply the most suitable search strategy to design problem solving agents
ECC602.3	Represent a natural language description of statements in logic and apply the inference rules to design Knowledge Ba
ECC602.4	Apply a probabilistic model for reasoning under uncertainty.
ECC602.5	Comprehend various learning techniques
ECC602.6	Describe the various building blocks of an expert system for a given real world problem.
<b>Course Code &amp; Name</b>	ECC 603 Computer Networks
ECC 603.1	Enumerate the layers of OSI model and TCP/IP model and describe their functions.
ECC 603.2	Identify the characteristics of network devices and media used to design networks.
ECC 603.3	Demonstrate the knowledge of networking protocols at various layers of TCP/IP model.
ECC 603.4	Classify the routing protocols and analyse how to assign the IP addresses for a given network
ECC 603.5	Design and configure the networks using IP addressing and sub-netting / super-netting schemes
ECC 603.6	Explain the functions of Application layer and Presentation layers, their paradigms and Protocols.

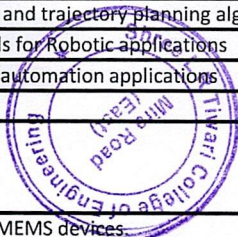


<b>Course Code &amp; Name</b>	ECL 601 Embedded Systems Lab
ECL 601.1	Interface various sensors and actuators to embedded cores
ECL 601.2	Write code using RTOS for multi-tasking Embedded systems
ECL 601.3	
<b>Course Code &amp; Name</b>	ECL 602 Artificial Intelligence and Computer Networks Lab
ECL 602.1	Identify suitable Agent Architecture for a given real world AI problem
ECL 602.2	Implement simple programs using Prolog.
ECL 602.3	Implement various search techniques for a Problem-Solving Agent
ECL 602.4	Represent natural language description as statements in Logic and apply inference rules to it
ECL 602.5	Construct a Bayesian Belief Network for a given problem and draw probabilistic inferences from it.
ECL 602.6	Design and implement various network applications such as data transmission between client and server, file transfer
ECL 602.7	Determine how to assign the IP addresses and configure a network on different operating environments.
ECL 602.8	Configure the networks using IP addressing and subnetting / supernetting schemes using various OS commands
<b>Course Code &amp; Name</b>	ECL 601 Embedded Systems Lab
ECL 601.1	Interface various sensors and actuators to embedded cores.
ECL 601.2	Write code using RTOS for multi-tasking Embedded systems
ECL 601.3	Design applications using different embedded cores
<b>Course Code &amp; Name</b>	ECL 602 Artificial Intelligence and Computer Networks Lab
ECL 602.1	Identify suitable Agent Architecture for a given real world AI problem
ECL 602.2	Implement simple programs using Prolog.
ECL 602.3	Implement various search techniques for a Problem-Solving Agent.
ECL 602.4	Represent natural language description as statements in Logic and apply inference rules to it.
ECL 602.5	Construct a Bayesian Belief Network for a given problem and draw probabilistic inferences from it.
ECL 602.6	Design and implement various network applications such as data transmission between client and server, file transfer
ECL 602.7	Determine how to assign the IP addresses and configure a network on different operating environments.
ECL 602.8	Configure the networks using IP addressing and subnetting / supernetting schemes using various OS commands
<b>Course Code &amp; Name</b>	ECL603 Data Warehousing and Mining Lab
ECL 603.1	Design data warehouse using dimensional modelling
ECL 603.2	Perform different OLAP operations
ECL 603.3	Differentiate among different data mining techniques and decide the applicability for each
ECL 603.4	Demonstrate classifications, prediction, etc. on datasets using open source tools
ECL 603.5	Perform Market basket analysis in real world data using data mining tools
ECL 603.6	Appreciate and visualize clustering techniques
<b>Course Code &amp; Name</b>	ECL604 Skill base Lab: Linux Server Administration Lab
ECL 604.1	Understand the concept of Open-source technology and basics of Linux operating system
ECL 604.2	Learn various Linux Command Line administration tasks and perform file, user, group and process management tasks
ECL 604.3	Learn various Linux Command Line utilities to perform storage and network management tasks
ECL 604.4	Learn Linux Server administration tasks and configure servers for front and backend services.
ECL 604.5	Analyse a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve th
ECL 604.6	Apply security measures to protect the operating environment and explain virtualization and their role in elastic comp
<b>Course Code &amp; Name</b>	ECM 601 Mini project – 2B
ECM 601.1	Identify problems based on societal /research needs.
ECM 601.2	Apply knowledge and skill to solve societal problems in a group
ECM 601.3	Develop interpersonal skills to work as member of a group or leader
ECM 601.4	Draw the proper inferences from available results through theoretical/experimental/simulations
ECM 601.5	Analyze the impact of solutions in societal and environmental context for sustainable development
ECM 601.6	Use standard norms of engineering practices.
ECM 601.7	Excel in written and oral communication
ECM 601.8	Demonstrate capabilities of self-learning in a group, which leads to life-long learning



<b>Course Code &amp; Name</b>	not decided yet
<b>Course Code &amp; Name</b>	ECL701 VLSI Design Lab
ECL 701.1	Demonstrate transfer, dynamic characteristics of various digital circuits.
ECL 701.2	Understand the circuit design using various simulation tools 3
ECL 701.3	Demonstrate layouts for various circuits and doing simulations
ECL 701.4	Understand the variation in the behaviour after extraction.
<b>Course Code &amp; Name</b>	ECL 702 Internet of Things
ECL 702.1	Interface various sensors to any IoT device and push data onto cloud.
ECL 702.2	Remotely control various devices using Blynk App and Node-red environment.
ECL 702.3	Implement IoT protocols to control devices remotely
ECL 702.4	Implement services like Google Assistance, Adafruit I/O, IFTTT, Firebase etc in IoT.
ECL 702.5	Configure AWS Cloud and its Application in IoT
<b>Course Code &amp; Name</b>	ISP701 Major Project – I
ISP 701.1	Identify problems based on societal /research needs.
ISP 701.2	Apply Knowledge and skill to solve societal problems in a group
ISP 701.3	Develop interpersonal skills to work as member of a group or leader.
ISP 701.4	Draw the proper inferences from available results through theoretical/ experimental/simulations
ISP 701.5	Analyze the impact of solutions in societal and environmental context for sustainable development
ISP 701.6	Use standard norms of engineering practices
ISP 701.7	Excel in written and oral communication.
ISP 701.8	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
ISP 701.9	Demonstrate project management principles during project work.
<b>Course Code &amp; Name</b>	ECC 801 Robotics
ECC 801.1	Describe the basics of Robotics
ECC 801.2	Describe and derive kinematics and dynamics of stationary and mobile robots
ECC 801.3	Apply trajectory planning algorithms
ECC 801.4	Describe concepts of robot motion planning algorithms
ECC 801.5	Apply image processing in robotic vision
ECC 801.6	Identify suitable Robot language based on applications
<b>Course Code &amp; Name</b>	ECC DO801 MEMS Technology
ECC DO801.1	Understand the different MEMS devices, working principles, materials and their properties.
ECC DO801.2	Design and simulate MEMS devices using standard simulation tools.
ECC DO801.3	Develop different concepts of MEMS sensors and actuators for real-world applications.
ECC DO801.4	Understand the rudiments of Micro-fabrication techniques.
<b>Course Code &amp; Name</b>	not decided yet
<b>Course Code &amp; Name</b>	ECL 801 Robotics lab
ECL 801.1	Use the acquired knowledge in solving direct and inverse kinematics problems
ECL 801.2	Select and Implement suitable task and trajectory planning algorithms.
ECL 801.3	Develop suitable programming tools for Robotic applications
ECL 801.4	Construct Robots/Robotic arms for automation applications
<b>Course Code &amp; Name</b>	ECL 802 MEMS Technology
ECL 802.1	Determine various parameters for MEMS devices.
ECL 802.2	Plot characteristics of MEMS devices.
ECL 802.3	Select particular device for specific application.

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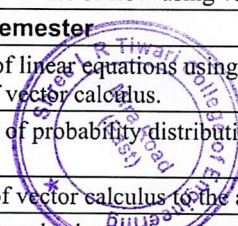
## Course Outcomes

### Third Semester

course code	course name	course outcomes
CE-C301	Applied Mathematics III	Solve the Ordinary and Partial Differential Equations using Laplace Transformation.
		Solve Ordinary and Partial Differential Equations using Fourier series.
		Solve initial and boundary value problems involving ordinary differential equations Fit the curve using concept of correlation and regression.
		Apply bilinear transformations and conformal mappings
		Identify the applicability of theorems and evaluate the contour integrals.
CE-C 302	Surveying I	Measure vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
		Perform various practical and hence projects using different surveying instruments.
		Apply geometric principles for computing data and drawing plans and sections
		Analyze the obtained spatial data and compute areas and volumes and represent 3D data on plane surfaces (2D) as contours
CE-C 303	Strength of Materials	Understand the concepts of shear force, bending moment, axial force for statically determinate beams and compound beams having internal hinges; and subsequently, its application to draw the shear force, bending moment and axial force diagrams.
		Analyze the flexural members for its structural behavior under the effect of flexure (bending), shear and torsion either independently or in combination thereof.
		Study the behavior of the structural member under the action of axial load, bending and twisting moment.
		Study the deformation behavior of axially loaded columns having different end conditions and further, evaluate the strength of such columns.
		The successful completion of the course will equip the students for undertaking the courses dealing with the analysis and design of determinate and indeterminate structures.
CE-C 304	Engineering Geology	Understand the significance of geological studies for safe, stable and economic design of any civil engineering structure.
		Demonstrate the knowledge of geology to explain major geological processes such as formation of mountain, ocean and the occurrence and distribution of earthquakes and volcanoes.
		Explain various geological structures like folds, faults, joints, unconformity, their origin and distribution which are very essential in the design and construction of dams, tunnels and any other major civil engineering project.
		Understand methods of surface and subsurface investigation, advantages and disadvantages caused due to geological conditions during the construction of dam and tunnel.
		Understand the causes and prevention of natural hazard like earthquake, landslide, volcano etc. will help student to meet the specific needs with suitable considerations for public health and safety.
		Prepare effective reports mentioning advantages and disadvantages caused due to geological condition and can evaluate any site for civil engineering project.
CE-C 305	Fluid Mechanics I	Define various properties of fluids, state and explain different types of laws and principles of fluid mechanics.
		Interpret different forms of pressure measurement and Calculate Hydrostatic Force and its Location for a given geometry and orientation of plane surface.
		Compute force of buoyancy on a partially or fully submerged body and analyse the stability of a floating body.
		Distinguish velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow.
		Derive Euler's Equation of motion and Deduce Bernoulli's equation
		Measure velocity and rate of flow using various devices.
<b>Fourth semester</b>		
CE-C 401	Applied Mathematics IV	Solve the system of linear equations using matrix algebra with its specific rules. Illustrate basics of vector calculus.
		Apply the concept of probability distribution and sampling theory to engineering problems
		Apply principles of vector calculus to the analysis of engineering problems.
		Identify, formulate and solve engineering problems.

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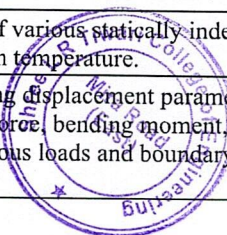


		Illustrate basic theory of correlations and regression.
CE-C 402	Surveying II	Operate Total Station & GPS for desired accuracy in surveying and establish survey control of determined accuracy using Total Station, GPS, GIS and remote sensing. Set out various types of curves by linear and angular methods Compute setting out data from survey and design information. Generate and manipulate field survey data and incorporate design data using specialised software's. Appreciate the role of various governmental authorities in maintaining cadastral survey records.
CE-C 403	Structural Analysis I	Understand the behavior of various statically determinate structures including compound structures having an internal hinge for various loadings. Analyze these structures to find out the internal forces such as axial force, shear force, bending moment, twisting moments, etc. Evaluate the displacements / deflections in beams and frames under the action of loads. They will be able to obtain the response of the beams under the action of moving loads. Analyze the structures such as arches and suspension bridges and study the behavior of eccentrically loaded columns. Analyze the section with respect to unsymmetrical bending and shear center. <i>Demonstrate the ability to extend the knowledge gained in this subject in the subjects Structural Analysis-II and elective subjects such as Advanced Structural Analysis and Advanced Structural Mechanics in the higher years of their UG programme where they will be dealing with the indeterminate structures. The knowledge gained in this subject shall also be useful for application in the structural design in later years.</i>
CE-C 404	Building Design and Drawing	Students will be able to list down the types of structures and its various components (for eg. doors, windows, staircase, foundations etc.) Students will be able to explain various concepts pertaining to building design and drawing (for eg, principles of planning, architectural planning, green buildings etc.) Students will be able to apply principles of planning, architectural planning and building bye laws while designing and preparing building drawings. Students will be able to calculate and analyze various technical details of a building (for eg. carpet area, FSI etc.) from its drawings. Students will be able to design various components of buildings (for eg. staircases etc.) as well as buildings as a whole, given the requirements of the building owner and local D.C. laws. Students will be able to prepare drawings (for eg. plans, elevation, perspective views etc.) of the designed components of buildings as well as buildings as a whole.
CE-C 405	Building Materials and Construction Technology	Identify and list the various building materials, their properties and symbols. Identify the properties of ingredients of concrete, interpret and design concrete mix for various grades Explain and interpret manufacturing process of basic construction materials and understand various masonry construction and finishes Perform tests on various materials.
CE-C 406	Fluid Mechanics II	Interpret different pipe fittings and evaluate the fluid velocity considering major and minor losses. Solve pipe network problems by Hardy cross method. Distinguish the types of compressible flow and understand concept of boundary layer theory. Evaluate pressure drop in pipe flow using Hagen-Poiseuille's equation for laminar flow in a pipe. Establish Prandtl's mixing theory and solve turbulent flow problems.
<b>Fifth semester</b>		
CEC501	Structural Analysis-II	Understand the behavior of various statically indeterminate structures subjected to static loads and variation in temperature. Analyze the structures using displacement parameters to find out the internal forces such as axial force, shear force, bending moment, twisting moments, etc. for beams, 2D portal frames with various loads and boundary conditions, which becomes the basis for structural design.




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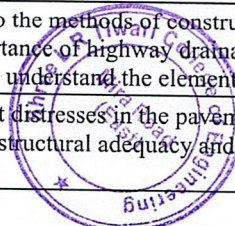
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		<p>Contrast between the concept of force and displacement methods of analysis of indeterminate structures. Also, the elastic curve in beams and frames under the action of loads.</p> <p>Understand the concept of plastic hinge, plastic moment carrying capacity, shape factor and collapse load for single and multiple span beams.</p> <p>Find out the approximate dimensions of beams and columns using the approximate method for giving the input in design software. The knowledge gained in this subject shall also be useful for application in the structural design in later years and also useful in the civil engineering field for the analysis purpose.</p> <p>Demonstrate the ability to extend the knowledge gained in this subject for their higher years UG Programme subjects such as Advanced Structural Analysis and Advanced Structural Mechanics in which they will be dealing with the indeterminate structures.</p>
CEC502	<b>Geotechnical Engineering-I</b>	<p>Understand the soil types, index and engineering properties and relationship between various unit weights &amp; other parameters.</p> <p>Classify the soil with a view towards assessing the suitability of a given soil for use; either to use it to support a structure (e.g. embankment) or to construct a structure therein (e.g. foundation)</p> <p>Understand the use of geosynthetics in soil to improve soil properties.</p> <p>Evaluate the compaction characteristics in laboratory &amp; field and hence interpret the results with compaction specifications.</p> <p>Interpret soil boring data for foundation design.</p> <p>Conduct laboratory experiments to collect, analyze, interpret and present the data</p>
CEC503	<b>Applied Hydraulics</b>	<p>Apply the concepts of fluid dynamics to solve pipe bend and sprinkler problems.</p> <p>Analyze dimensional problems and explain model laws.</p> <p>Explain the working and functions of Francis, Kaplan and Pelton wheel turbines.</p> <p>Explain the basic concepts of open channel hydraulics and measure discharge through open channels.</p> <p>Identify the occurrence of hydraulic jump and its parameters</p> <p>Explain uniform flow, non-uniform flow and establish mathematical relationships.</p>
CEC504	<b>Environmental Engineering-I</b>	<p>Understand the water supply system, its components and water demand by various consumers.</p> <p>Understand and analyze the quality of water and will be able to conduct the quality control test on samples.</p> <p>Understand the different processes in the water treatment facility.</p> <p>Design the different units of treatment for water treatment plants.</p> <p>Understand the components of building water supply system, storage and rain water harvesting.</p> <p>Understand the problems of air and noise pollution. Besides, they will be prepared to contribute practical solutions to environmental problems in our society.</p>
CEC505	<b>Transportation Engineering-I</b>	<p>To get an insight of the development in all the fields of highway engineering and familiarized with different surveys required to be carried out for the implementation of the highway project; to understand the phase of engineering which deals with the planning and geometrics design of streets, highways and abutting land in the context of safe and convenient traffic operations thereon.</p> <p>To know the required properties of the different materials to be used in the construction of highways and other allied structures, to understand characterization of the materials and to evaluate their suitability; understand the principle of soil stabilization, utilization of geosynthetics in the construction of highway and allied structures</p> <p>To understand the classification of different types of pavements, factors to be considered in the design of pavements, approaches for designing the different types of pavements and can the flexible and rigid pavements be using IRC Specifications.</p> <p>To get an insight into the methods of construction of different types of pavements; along with the importance of highway drainage and various methods of providing the drainage; also, to understand the elements of bridge engineering.</p> <p>To illustrate different distresses in the pavements, evaluate the pavements in terms of its functional and structural adequacy and arrive upon the rehabilitation measures.</p>

  
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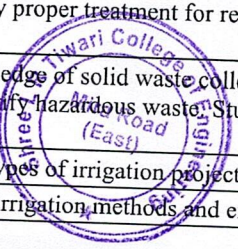




		To explain methods to strengthen the distressed pavements, low volume and low-cost road and also to understand the significance of the drainage in the field of highway engineering including different methods of providing the drainage in the highways.
CE-DLO 5063	Department Level Optional Course-I: Building Services & Repairs	Understand the importance & installation of utility services.
		Understand the drawbacks of all the service lines are not installed properly or if materials used are faulty.
		Choose appropriate systems & integrate the same into the building construction projects.
		Assess the structural health of the buildings & infrastructural works and also Inspect & evaluate the damaged structures.
		Implement the techniques for repairing the concrete structures and also decide whether or not the structure should be dismantled, if it is deteriorated beyond repair.
		Employ the methods of steel protection in the field.
		Understand the damage caused by fire & exercise due care for fire safety

### Sixth Semester

CEC601	Geotechnical Engineering-II	Students will be able to calculate the shear strength parameters for the soil.
		Students will be able to calculate the factors of safety of different types of slopes under various soil conditions, analyze the stability of slopes, calculate lateral earth pressures and analyse the stability of retaining walls.
		Students will be able to calculate bearing capacity of shallow foundations using theoretical and field methods, calculate load bearing capacity of individual as well as group of pile foundations and their settlement using theoretical and field methods
		Students will be able to explain conduits and calculate the load carried by the struts of a braced cut under various soil conditions
		Students will be able to explain ground improvement techniques.
CEC602	Design and Drawing of Steel Structures	Explain the Limit State Design philosophy as applied to steel structures.
		Predict the behavior and design members subjected to axial compression, tension and their connection.
		Predict the behavior and design members subjected to bending, shear and their connection
		Calculate loading for a truss and design the complete truss.
		Demonstrate ability to follow IS codes, design tables and aids in analysis and design steel structures
		Analyze and design the commercial steel structures and prepare drawing with complete detailing.
CEC603	Transportation Engineering-I	Understand the various systems of railway, airport, water transportation and the components of p-way and its construction, yards, modernization of railway track.
		Apply the concept of geometric design of railway track and railway traffic control.
		Understand airport planning, obstructions and orientation of runway.
		Apply the concept of geometric design of runway, taxiway, etc. and the knowledge of various signaling system for air traffic control.
		Understand the system of water transportation, types of breakwater, harbours and port facilities equipment
CE-C604	Environmental Engineering	Understand the basic idea about the bridge engineering.
		Explain wastewater collection systems in buildings and municipal areas and to determine the quantity of wastewater and storm water production. Also, gain the knowledge of the construction of new sewer line and importance of sewer appurtenances.
		Explain and analyze the characteristics of wastewater and design the primary treatment for wastewater
		Explain on-site treatment methods and solve Analyze and design wastewater treatment systems (ASP, Aerated lagoon and Oxidation ponds).
		Identify and apply proper treatment for reclamation and reuse of wastewater and disposal.
		To provide knowledge of solid waste collection system, characteristics of solid waste and to identify hazardous waste. Study related to plastic waste management will be studied.
CEC605	Water Resources Engineering	Classify various types of irrigation projects
		Explain different irrigation methods and effective use of water resources.



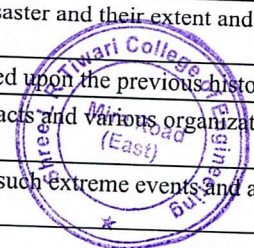


		Calculate the crop water requirements and irrigation requirement.
		Derive hydrographs and calculate runoff of a catchment area.
		Explain the steady state and unsteady state conditions of any aquifer and design water wells.
		Estimate the capacity of a reservoir for different purposes.
CE-DLO6061	Department Level Optional Course-II-Advanced Construction Equipment	<ul style="list-style-type: none"> <li>Understand the use/applications of various conventional construction equipment and select the best out of them for a particular site requirement.</li> <li>Know modern methods/equipment used for underground as well as underwater tunnelling.</li> <li>Compare conventional and modern methods of formwork on the basis of productivity, reuse value, ease of erection and dismantling, flexibility offered and overall cost.</li> <li>Understand the techniques involved and the equipment required thereof for construction of various transporting facilities.</li> <li>Gain knowledge about the setting up of different kinds of the power generating structures.</li> <li>Select proper equipment for construction of transporting facilities based on requirements.</li> </ul>
<b>Seventh Semester</b>		
CE-C 701	Quantity Survey, Estimation & Valuation	<ul style="list-style-type: none"> <li>Apply the measurement systems to various civil engineering items of work.</li> <li>Draft the specifications for various items of work &amp; determine unit rates of items of works</li> <li>Estimate approximate cost of the structures by using various methods &amp; prepare detailed estimates of various civil engineering structures by referring drawings.</li> <li>Assess the quantities of earthwork &amp; construct mass haul diagrams.</li> <li>Draft tender notice &amp; demonstrate the significance of the tender as well as contract process.</li> <li>Determine the present fair value of any constructed building at stated time.</li> </ul>
CE-C 702	Theory of Reinforced Concrete Structures	<ul style="list-style-type: none"> <li>Understand the pros and cons of the WSM and LSM.</li> <li>Understand the various clauses specified in IS: 456-2000 for designing structural members with the safety and economy.</li> <li>Carry out analysis and design of various elements of the reinforced concrete structures such as beam, slab, column, footings using the concept of Limit state method.</li> <li>Understand and the use of readymade design curves from Special publications of Bureau of Indian standards.</li> </ul>
CE-C 703	Water Resources Engineering II	<ul style="list-style-type: none"> <li>Design the section of gravity dams, earth and rockfill dams, arch dams and buttress dams.</li> <li>Design spillways and energy dissipaters.</li> <li>Apply silt theories to design irrigation canals.</li> <li>Explain various types of canals and its maintenance.</li> </ul>
CE-DLO 7042	Department Level Elective: Solid Waste Management	<ul style="list-style-type: none"> <li>Explain different cross drainage works of a canal system</li> <li>Explain generation, storage, collection, transfer and transport, processing, recovery and disposal in the management of solid waste.</li> <li>Understand the characteristics of different types of solid waste and the factors affecting variation.</li> <li>Identify the methods of collection, storage and transportation of solid waste.</li> <li>Suggest suitable technical solutions for processing of wastes.</li> <li>Ability to plan waste minimization and disposal of municipal solid waste.</li> <li>Ensure the safe handling and treatment of Hazardous, Electronic and Biomedical waste.</li> </ul>
CE-C ILOC7017	Disaster Management and Mitigation Measures	<ul style="list-style-type: none"> <li>Get to know natural as well as manmade disaster and their extent and possible effects on the economy</li> <li>Plan of national importance structures based upon the previous history.</li> <li>Get acquainted with government policies, acts and various organizational structure associated with an emergency.</li> <li>Get to know the simple do's and don'ts in such extreme events and act accordingly.</li> </ul>



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Eighth semester





CE-C 801	<b>Design and Drawing of Reinforced Concrete Structures</b>	Design independently RCC structure by applying IS code provisions.
		· Design staircase, water tank and retaining wall.
		· Explain principles of PSC and calculate losses.
		· Draw and explain the structural detailing.
CE-C 802	<b>Construction Management</b>	Explain response of structure during an earthquake and calculate design forces.
		· Understand & apply the knowledge of management functions like planning, scheduling, executing & controlling the construction projects.
		· Prepare feasible project schedule by using various scheduling techniques.
		· Gain knowledge of managing various resources & recommend best method of allocating the resources to the project.
		· develop optimum relationship between time & cost for construction project
		· Implement quality & safety measures on construction sites during execution of civil engineering projects.
		· Understand the importance of labour legislation
CE-C DLO8032	<b>Department Level Elective: Industrial Waste Treatment</b>	· Understand the characteristics of industrial wastewater.
		· Identify sampling method and analyze industrial waste.
		· Design facilities for the processing and reclamation of industrial waste water.
		· Explain on-site treatment methods and solve Analyze and design wastewater treatment systems. (floatation, vacuum filtration, centrifugation, filter press and membrane filters)
		· Detailed on-site manufacturing processes and treatments of industrial waste water.
		· Analyze proposed development project plans for possible environmental effects and to
CE-C ILOC8021	<b>Institute Level Elective: Project Management</b>	· Apply selection criteria and select an appropriate project from different options.
		· Write work break down structure for a project and develop a schedule based on it.
		· Identify opportunities and threats to the project and decide an approach to deal with them strategically.
		· Use Earned value technique and determine & predict status of the project.
		· Capture lessons learned during project phases and document them for future reference
CE-C ILOC8028	<b>Institute level Elective : Environmental Management</b>	· Understand the concept of environmental management
		· Understand ecosystem and interdependence, food chain etc.
		· Understand and interpret environment related legislations



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MEL302	Machine Shop	6. Perform flexural test with central and three point loading conditions 1. Know the specifications, controls and safety measures related to machines and machining operations. 2. Use the machines for making various engineering jobs. 3. Perform various machining operations 4. Perform Tool Grinding 5. Perform welding operations
MESBL301	Skill Based Lab: CAD – Modeling	1. Illustrate basic understanding of types of CAD model creation. 2. Visualize and prepare 2D modeling of a given object using modelling software. 3. Build solid model of a given object using 3D modeling software. 4. Visualize and develop the surface model of a given object using modelling software. 5. Generate assembly models of given objects using assembly tools of a modelling software 6. Perform product data exchange among CAD systems.
MEPBL301	Mini Project - 1A	1. Identify problems based on societal /research needs. 2. Apply Knowledge and skill to solve societal problems in a group. 3. Develop interpersonal skills to work as member of a group or leader. 4. Draw the proper inferences from available results through theoretical/ experimental/simulations. 5. Analyse the impact of solutions in societal and environmental context for sustainable development. 6. Use standard norms of engineering practices 7. Excel in written and oral communication. 8. Demonstrate capabilities of self-learning in a group, which leads to life long learning. 9. Demonstrate project management principles during project work.

MECHANICAL DEPARTMENT

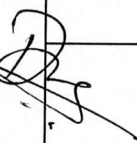
SECOND YEAR

EVEN SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC401	Engineering Mathematics-IV	1. Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theore. 2. Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals. 3. Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science. 4. Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities. 5. Apply the concept of probability distribution to engineering problems & Testing hypothesis of small samples using sampling theory 6. Apply the concepts of parametric and nonparametric tests for analyzing practical problems.
MEC402	Fluid Mechanics	1. Define properties of fluids, classify fluids and evaluate hydrostatic forces on various surfaces. 2. Illustrate understanding of dimensional analysis of Thermal and Fluid systems. 3. Differentiate velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow. 4. Formulate and solve equations of the control volume for fluid flow systems and Apply Bernoulli's equation to various flow measuring devices. 5. Calculate pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes. 6. Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces.








MEC403	Kinematics of Machinery	<ol style="list-style-type: none"> <li>3. Draw velocity and acceleration diagrams of various mechanisms</li> <li>4. Choose a cam profile for the specific follower motion</li> <li>5. Predict condition for maximum power transmission in the case of a belt drive</li> <li>6. Illustrate requirements for an interference-free gear pair</li> </ol>
MEC404	CAD/CAM	<ol style="list-style-type: none"> <li>1. Identify suitable computer graphics techniques for 3D modelling.</li> <li>2. Transform, manipulate objects &amp; store and manage data.</li> <li>3. Develop 3D model using various types of available biomedical data.</li> <li>4. Create the CAM Toolpath for specific given operations.</li> <li>5. Build and create data for 3D printing of any given object using rapid prototyping and tooling processes.</li> <li>6. Illustrate understanding of various cost effective alternatives for manufacturing products.</li> </ol>
MEC405	Industrial Electronics	<ol style="list-style-type: none"> <li>1. Illustrate construction, working principles and applications of power electronic switches.</li> <li>2. Identify rectifiers and inverters for dc and ac motor speed control.</li> <li>3. Develop circuits using OPAMP and Timer IC 555.</li> <li>4. Identify digital circuits for industrial applications.</li> <li>5. Demonstrate the knowledge of basic functioning of microcontrollers.</li> <li>6. Analyze speed-torque characteristics of electrical machines for speed control.</li> </ol>
MEL401	Industrial Electronics	<ol style="list-style-type: none"> <li>1. Demonstrate characteristics of various electrical and electronics components</li> <li>2. Develop simple applications built around these components</li> <li>3. Identify use of different logic gates and their industrial applications</li> <li>4. Built and demonstrate parameter measurements using microcontroller</li> <li>5. Test and Analyze speed-torque characteristics of electrical machines for speed control.</li> </ol>
MEL402	Kinematics of Machinery	<ol style="list-style-type: none"> <li>1. Draw velocity diagram using Instantaneous Centre method</li> <li>2. Find velocity and acceleration of a point on a four-bar mechanism by using Relative method.</li> <li>3. Analyze velocity and acceleration of a specific link of a slider crank mechanism using graphical approach by Relative method.</li> <li>4. Plot displacement-time, velocity-time, and acceleration-time diagrams of follower motion.</li> <li>5. Draw cam profile for the specific follower motion.</li> <li>6. Develop and build mechanisms to provide specific motion.</li> </ol>
MEL403	Python Programming	<ol style="list-style-type: none"> <li>1. Demonstrate understand of basic concepts of python programming.</li> <li>2. Identify, install and utilize python packages</li> <li>3. Develop and execute python programs for specific applications.</li> <li>4. Develop and build python program to solve real-world engineering problems</li> <li>5. Prepare a report on case studies selected.</li> </ol>
MESDI 401	Skill based Lab: CNC	<ol style="list-style-type: none"> <li>1. Develop and execute part programming for any given specific operation.</li> <li>2. Build any given object using various CNC operations.</li> <li>3. Demonstrate CAM Tool path and prepare NC- G code.</li> </ol>



MEPBL401	Mini Project – 1B	6. Convert 2D images into 3D model
		1. Identify problems based on societal /research needs.
		2. Apply Knowledge and skill to solve societal problems in a group.
		3. Develop interpersonal skills to work as member of a group or leader.
		4. Draw the proper inferences from available results through theoretical/experimental/simulations.
		5. Analyse the impact of solutions in societal and environmental context for sustainable development.
		6. Use standard norms of engineering practices
		7. Excel in written and oral communication.
		8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		9. Demonstrate project management principles during project work.
MECHANICAL DEPARTMENT		
THIRD YEAR		
ODD SEMESTER		
COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC 501	ICE	Demonstrate the working of different systems and processes of S.I. engines
		Demonstrate the working of different systems and processes of C.I. engines
		Illustrate the working of lubrication, cooling and supercharging systems.
		Analyse engine performance
		Illustrate emission norms and emission control
		Comprehend the different technological advances in engines and alternate fuels
MEC502	tical Measurement and	Classify various types of static characteristics and types of errors occurring in the system
		Classify and select proper measuring instrument for linear and angular displacement
		Classify and select proper measuring instrument for pressure and temperature measurement
		Design mathematical model of system/process for standard input responses
		Analyse error and differentiate various types of control systems and time domain specifications
		Analyse the problems associated with stability
		MEC 503
Illustrate basic modes of heat transfer		
Develop mathematical model for each mode of heat transfer		
Develop mathematical model for transient heat transfer		
Demonstrate and explain mechanism of boiling and condensation		
Analyse different heat exchangers and quantify their performance		
MEC 504	Dynamics of Machinery	Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems
		Illustrate basic of static and dynamic forces
		Determine natural frequency of element/system
		Determine vibration response of mechanical elements / systems
		Design vibration isolation system for a specific application
		Demonstrate basic concepts of balancing of forces and couples
		Demonstrate various press working operations for mass production of sheet metal parts





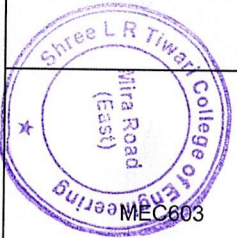


MEDLO5011	PTD	<p>Select suitable materials for different elements of press tools</p> <p>Illustrate the principles and blank development in bent &amp; drawn components</p> <p>Elaborate failure mechanisms of pressed components, safety aspects and automation in press working</p>
MEDLO5012	Machining Sciences An	<p>Calculate the values of various forces involved in the machining operations</p> <p>Design various single and multipoint cutting tools</p> <p>Analyse heat generation in machining operation and coolant operations</p> <p>Illustrate the properties of various cutting tool materials and hence select an appropriate tool material for particular machining application</p> <p>Demonstrate the inter-relationship between cutting parameters and machining performance measures like power requirement, cutting time, tool life and surface finish</p> <p>Analyse economics of machining operations</p>
MEL 501	ICE	<p>Dismantle engine assembly</p> <p>Overhaul and Assemble engine components</p> <p>Perform load test/speed test on engine setup</p> <p>Calculate performance of multi cylinder engine</p> <p>Analyse engine performance and draw heat balance sheet</p> <p>Perform exhaust gas analysis</p>
MEL 502	Technical Measurement and	<p>Calibrate displacement sensors</p> <p>Calibrate pressure and vacuum gauges</p> <p>Measure torque using strain gauges</p> <p>Identify system/process characteristics for standard input responses</p> <p>Identify various types of control systems and time domain specifications</p> <p>Analyse the problems associated with stability</p>
MEL 503	Heat Transfer	<p>Estimate thermal conductivity of metals/non metals/liquids</p> <p>Compute heat transfer coefficient in natural as well forced convection</p> <p>Measure emissivity of grey body</p> <p>Quantify fin effectiveness/efficiency</p> <p>Analyse heat exchanger performance</p> <p>Demonstrate energy balance for heat exchanger</p>
MEL 504	Dynamics of Machinery	<p>Plot and analyse governor characteristics</p> <p>Analyse gyroscopic effect on laboratory model</p> <p>Estimate natural frequency of mechanical systems</p> <p>Analyse vibration response of mechanical systems</p> <p>Determine damping coefficient of a system</p> <p>Balance rotating mass</p>
MEL 505	Manufacturing Sciences L	<p>Identify and select location and clamping faces/points on jobs.</p> <p>Design and develop simple productive and cost effective jigs and fixtures.</p> <p>Identify press tool requirements to build concepts pertaining to design of press tools.</p> <p>Select a proper force measurement method for the required machining operation.</p>



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MEL506	Business Communicati	Design a technical document using precise language, suitable vocabulary and apt style.
		Develop the life skills/ interpersonal skills to progress professionally by building stronger relationships.
		Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
		Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.
		Deliver formal presentations effectively implementing the verbal and non-verbal skills
MECHANICAL DEPARTMENT		
THIRD YEAR		
EVEN SEMESTER		
COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC 601	logy and Quality Engine	1. Demonstrate inspection methods and different gauges
		2. Illustrate working principle of measuring instruments and calibration methodology
		3. Illustrate basic concepts and statistical methods in quality control
		4. Demonstrate characteristics of screw threads, gear profile, and tool profile
		5. Illustrate the different sampling techniques in quality control
		6. Illustrate different nondestructive techniques used for quality evaluation
MEC602	Machine Design - 1	1 Demonstrate understanding of various design considerations
		2 Illustrate basic principles of machine design
		3 Design machine elements for statics as well as dynamic loading
		4 design machine elements on the basis of strength/rigidity concepts
		5 Use design data books in designing various components
		6 Acquire skill in preparing production drawings pertaining to various designs
MEC603	Finite Element Analysis	Solve differential equations using weighted residual methods
		Develop the finite element equations to model engineering problems governed by second order differential equations
		Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements
		Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements
		Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system
		Use commercial FEA software, to solve problems related to mechanical engineering
MEC604	RAC	1. Demonstrate fundamental principles of refrigeration and air conditioning
		2. Identify and locate various important components of the refrigeration and air conditioning system
		3. Illustrate various refrigeration and air conditioning processes using psychometric chart
		4. Design Air Conditioning system using cooling load calculations.
		5. Estimate air conditioning system parameters
		6. Demonstrate understanding of duct design concepts



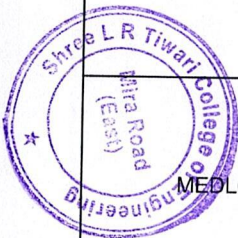


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MEDLO6021	mechatronics	<ol style="list-style-type: none"> <li>4. Develop ladder logic programming</li> <li>5. Design hydraulic/pneumatic circuits</li> <li>6. Design a mechatronic system</li> </ol>
MEL601	Technology and Quality Engineering	<ol style="list-style-type: none"> <li>1. Measure linear and angular dimensions</li> <li>2. Measure surface roughness</li> <li>3. Measure various parameters of gear tooth profile</li> <li>4. Use optical profile projector for measurement</li> <li>5. Use various instruments for measurement of screw threads</li> <li>6. Measure flatness by Autocollimator / Interferometry method</li> </ol>
MEL602	Machine Design - 1	<ol style="list-style-type: none"> <li>1. Design shaft under various conditions</li> <li>2. Design Knuckle Joint / cotter joint</li> <li>3. Design Screw Jack/C-clamp along with frame</li> <li>4. Design Flexible flange couplings/ Leaf spring</li> <li>5. Convert design dimensions into working/manufacturing drawing</li> <li>6. Use design data book/standard codes to standardise the designed dimensions</li> </ol>
MEL603	Finite Element Analysis	<ol style="list-style-type: none"> <li>Select appropriate element for given problem</li> <li>Select suitable meshing and perform convergence test</li> <li>Select appropriate solver for given problem</li> <li>Interpret the result</li> <li>Apply basic aspects of FEA to solve engineering problems</li> <li>Validate FEA solution</li> </ol>
MEL604	RAC	<ol style="list-style-type: none"> <li>1. Demonstrate fundamental principles of refrigeration and air conditioning</li> <li>2. Identify and locate various important components of the refrigeration and air conditioning system</li> <li>3. Represent various refrigeration and air conditioning processes using psychometric chart</li> <li>4. Operate and maintain refrigeration system</li> <li>5. Operate and maintain air conditioning system</li> <li>6. Simulate VCRS</li> </ol>
MEL 605	Mechatronics Lab	<ol style="list-style-type: none"> <li>1. Demonstrate implementation of interfacing sensors and actuators using microcontrollers</li> <li>2. Demonstrate of interfacing various utilities with microcontrollers</li> <li>3. Demonstrate discrete control system using PLC microcontroller</li> <li>4. Design and develop a control system for specific use</li> <li>5. Implement program to PLC system and demonstrate its application</li> <li>6. Develop pneumatic circuits for a specific system</li> </ol>
MEDLO6023	Industrial Automation	<ol style="list-style-type: none"> <li>1. Demonstrate basics of industrial automation</li> <li>2. Identify various types of automation</li> <li>3. Demonstrate use of automated controls using pneumatic and hydraulic systems.</li> <li>4. Illustrate the control systems in automated system.</li> <li>5. Demonstrate applicability of PLC in process industry</li> <li>6. Design electro-pneumatic circuits</li> </ol>





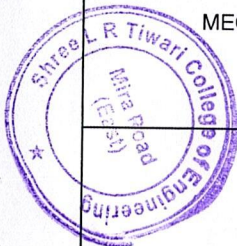


ODD SEMESTER		
COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC701	Machine Design II	1. Select appropriate gears for power transmission on the basis of given load and speed
		2. Design gears based on the given conditions.
		3. Select bearings for a given applications from the manufacturers catalogue.
		4. Select and/or design belts and flywheel for given applications
		5. Design cam and follower mechanisms.
		6. Design clutches and brakes
MEC702	CAD/CAM/CAE	1. Identify proper computer graphics techniques for geometric modelling.
		2. Transform, manipulate objects & store and manage data.
		3. CAM Toolpath Creation and NC- G code output.
		4. Use rapid prototyping and tooling concepts in any real life applications.
		5. Identify the tools for Analysis of a complex engineering component.
MEC703	Production Planning and Control	1. Illustrate production planning functions and manage manufacturing functions in a better way
		2. Develop competency in scheduling and sequencing of manufacturing operations
		3. Forecast the demand of the product and prepare an aggregate plan
		4. Develop the skills of Inventory Management and cost effectiveness
		5. Create a logical approach to Line Balancing in various production systems
		6. Implement techniques of manufacturing planning and control
MEDLO7032	Automobile Engineering	1. Illustrate the types and working of clutch and transmission system.
		2. Demonstrate the working of different types of final drives, steering gears and braking systems
		3. Illustrate the constructional features of wheels, tyres and suspension systems
		4. Demonstrate the understanding of types of storage, charging and starting systems
		5. Identify the type of body and chassis of an automobile
		6. Comprehend the different technological advances in automobile
MEDLO7034	Computational Fluid Dynamics	1. Demonstrate methodology to work with CFD
		2. Illustrate principles of grid generation and discretisation methods
		3. Identify and apply specific boundary conditions relevant to specific application
		4. Decide solution parameters relevant to specific application
		5. Analyze the results and draw the appropriate inferences
		6. Demonstrate basic principles of FVM
ILO 7015	Operations Research	1. Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
		2. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
		3. Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
		4. Understand the applications of integer programming and a queuing model and compute important performance measures
ILO 7018	Energy Audit and Management	1. To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
		2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
		3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities



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MEL701	Machine Design II	<ol style="list-style-type: none"> <li>3. Design cam &amp; followers for a given condition</li> <li>4. Design clutches for a given application</li> <li>5. Design brakes for given condition</li> <li>6. Select bearings for a given applications from the manufacturers catalogue</li> </ol>
MEL702	CAD/CAM/CAE	<ol style="list-style-type: none"> <li>1. Identify proper computer graphics techniques for geometric modelling.</li> <li>2. Transform, manipulate objects as well as store and manage data.</li> <li>3. Create CAM Toolpath and prepare NC- G code</li> <li>4. Apply rapid prototyping and tooling concepts in any real life applications.</li> <li>5. Identify the tools for Analysis of a complex engineering component.</li> </ol>
MEL703	Production Planning and Control	<ol style="list-style-type: none"> <li>1. Prepare a process sheet</li> <li>2. Prepare a Gantt Chart</li> <li>3. Forecast the demand of the product and prepare an aggregate plan.</li> <li>4. Perform ABC analysis of a given problem</li> <li>5. Develop the skills of Inventory Management and cost effectiveness.</li> <li>6. Create a logical approach to Line Balancing for various production systems.</li> </ol>

MECHANICAL DEPARTMENT

FINAL YEAR

EVEN SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC801	Design Of Mechanical System	<ol style="list-style-type: none"> <li>1. Apply the concept of system design.</li> <li>2. Design material handling systems such as hoisting mechanism of EOT crane,</li> <li>3. Design belt conveyor systems</li> <li>4. Design engine components such as cylinder, piston, connecting rod and crankshaft</li> <li>5. Design pumps for the given applications</li> <li>6. Prepare layout of machine tool gear box and select number of teeth on each gear</li> </ol>
MEC802	Industrial Engineering and Management	<ol style="list-style-type: none"> <li>1. Illustrate the need for optimization of resources and its significance</li> <li>2. Develop ability in integrating knowledge of design along with other aspects of value addition in the conceptualization and manufacturing stage of various products.</li> <li>3. Demonstrate the concept of value analysis and its relevance.</li> <li>4. Manage and implement different concepts involved in method study and understanding of work content in different situations.</li> <li>5. Describe different aspects of work system design and facilities design pertinent to manufacturing industries.</li> <li>6. Illustrate concepts of Agile manufacturing, Lean manufacturing and Flexible manufacturing</li> </ol>
MEL803	Power Engineering	<ol style="list-style-type: none"> <li>1. Compute heat interactions in combustion of reactive mixtures</li> <li>2. Differentiate boilers, boiler mountings and accessories</li> <li>3. Calculate boiler efficiency and assess boiler performance</li> <li>4. Demonstrate working cycles of gas turbines</li> <li>5. Draw velocity triangles of impulse/reaction turbines and calculate performance parameters/efficiency</li> </ol>



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MEDLO8043	Renewable Energy System	<ol style="list-style-type: none"> <li>2. Discuss importance of renewable energy sources</li> <li>3. Discuss various renewable energy sources in Indian context</li> <li>4. Calculate and analyse utilization of solar and wind energy</li> <li>5. Illustrate design of biogas plant</li> <li>6. Demonstrate basics of hydrogen energy</li> </ol>
ILO8021	Project Management	<ol style="list-style-type: none"> <li>1. Apply selection criteria and select an appropriate project from different options.</li> <li>2. Write work break down structure for a project and develop a schedule based on it.</li> <li>3. Identify opportunities and threats to the project and decide an approach to deal with them strategically</li> <li>4. Use Earned value technique and determine &amp; predict status of the project.</li> <li>5. Capture lessons learned during project phases and document them for future reference</li> </ol>
ILO8029	Environmental Management	<ol style="list-style-type: none"> <li>1. Understand the concept of environmental management</li> <li>2. Understand ecosystem and interdependence, food chain etc.</li> <li>3. Understand and interpret environment related legislations</li> </ol>
MEL801	Design Of Mechanical System	<ol style="list-style-type: none"> <li>1. Apply the concept of system design.</li> <li>2. Design of hoisting mechanism of EOT crane,</li> <li>3. Design belt conveyor systems</li> <li>4. Design pumps for the given applications</li> <li>5. Design engine components such as cylinder, piston, connecting rod and crankshaft</li> <li>6. Design of machine tool gearbox</li> </ol>
MEL803	Power Engineering	<ol style="list-style-type: none"> <li>1. Differentiate boilers</li> <li>2. Differentiate boiler mountings and accessories</li> <li>3. Conduct a trial on impulse turbine and analyse its performance</li> <li>4. Conduct a trial on reaction turbine and analyse its performance</li> <li>5. Conduct a trial on Centrifugal pump and analyse its performance</li> <li>6. Conduct a trial on Reciprocating pump and analyse its performance</li> </ol>



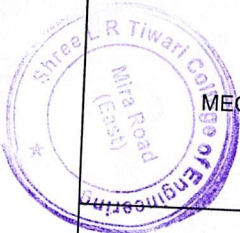


## MECHANICAL DEPARTMENT

SECOND YEAR

ODD SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC301	Engineering Mathematics-III	<ol style="list-style-type: none"> <li>1. Apply the concept of Laplace transform to solve the real integrals in engineering problems.</li> <li>2. Apply the concept of inverse Laplace transform of various functions in engineering problems.</li> <li>3. Expand the periodic function by using Fourier series for real life problems and complex engineering problems.</li> <li>4. Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.</li> <li>5. Apply Matrix algebra to solve the engineering problems.</li> <li>6. Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations</li> </ol>
MEC302	SOM	<ol style="list-style-type: none"> <li>1. Demonstrate fundamental knowledge about various types of loading and stresses induced.</li> <li>2. Draw the SFD and BMD for different types of loads and support conditions.</li> <li>3. Analyze the bending and shear stresses induced in beam.</li> <li>4. Analyze the deflection in beams and stresses in shaft.</li> <li>5. Analyze the stresses and deflection in beams and Estimate the strain energy in mechanical elements.</li> <li>6. Analyze buckling phenomenon in columns.</li> </ol>
MEC303	Production Processes	<ol style="list-style-type: none"> <li>1. Demonstrate an understanding of casting process</li> <li>2. Illustrate principles of forming processes.</li> <li>3. Demonstrate applications of various types of welding processes.</li> <li>4. Differentiate chip forming processes such as turning, milling, drilling, etc.</li> <li>5. Illustrate the concept of producing polymer components and ceramic components.</li> <li>6. Illustrate principles and working of non-traditional manufacturing</li> <li>7. Understand the manufacturing technologies enabling Industry 4.0</li> </ol>
MEC304	Materials and Metallurgy	<ol style="list-style-type: none"> <li>1. Identify various crystal imperfections, deformation mechanisms, and strengthening mechanisms.</li> <li>2. Demonstrate understanding of various failure mechanisms of materials.</li> <li>3. Interpret Iron-Iron carbide phase diagram, and different phases in microstructures of materials at different conditions.</li> <li>4. Select appropriate heat treatment process for specific applications.</li> <li>5. Identify effect of alloying elements on properties of steels</li> <li>6. Illustrate basics of composite materials, Nano- materials and smart materials.</li> </ol>
MEC305	Thermodynamics	<p>MEC305.1: Demonstrate application of the laws of thermodynamics to a wide range of systems</p> <p>MEC305.2: Compute heat and work interactions in thermodynamic systems</p> <p>MEC305.3: Demonstrate the interrelations between thermodynamic functions to solve practical problems.</p> <p>MEC305.4: Compute thermodynamic interactions using the steam table and Mollier chart</p> <p>MEC305.5: Compute efficiencies of heat engines, power cycles.</p> <p>MEC305.6: Apply the fundamentals of compressible fluid flow to the relevant systems</p>
MFI 301	Material Testing	<ol style="list-style-type: none"> <li>1. Prepare metallic samples for studying its microstructure following the appropriate procedure.</li> <li>2. Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test</li> <li>3. Perform Fatigue Test and draw S-N curve</li> </ol>





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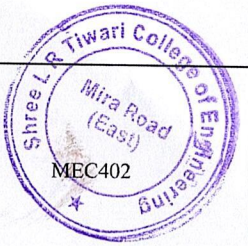
MEL302	Machine Shop	<ol style="list-style-type: none"> <li>6. Perform flexural test with central and three point loading conditions</li> <li>1. Know the specifications, controls and safety measures related to machines and machining operations.</li> <li>2. Use the machines for making various engineering jobs.</li> <li>3. Perform various machining operations</li> <li>4. Perform Tool Grinding</li> <li>5. Perform welding operations</li> </ol>
MESBL301	Skill Based Lab: CAD – Modeling	<ol style="list-style-type: none"> <li>1. Illustrate basic understanding of types of CAD model creation.</li> <li>2. Visualize and prepare 2D modeling of a given object using modelling software.</li> <li>3. Build solid model of a given object using 3D modeling software.</li> <li>4. Visualize and develop the surface model of a given object using modelling software.</li> <li>5. Generate assembly models of given objects using assembly tools of a modelling software</li> <li>6. Perform product data exchange among CAD systems.</li> </ol>
MEPBL301	Mini Project - 1A	<ol style="list-style-type: none"> <li>1. Identify problems based on societal /research needs.</li> <li>2. Apply Knowledge and skill to solve societal problems in a group.</li> <li>3. Develop interpersonal skills to work as member of a group or leader.</li> <li>4. Draw the proper inferences from available results through theoretical/ experimental/simulations.</li> <li>5. Analyse the impact of solutions in societal and environmental context for sustainable development.</li> <li>6. Use standard norms of engineering practices</li> <li>7. Excel in written and oral communication.</li> <li>8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>9. Demonstrate project management principles during project work.</li> </ol>

MECHANICAL DEPARTMENT

SECOND YEAR

EVEN SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC401	Engineering Mathematics-IV	1. Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem.
		2. Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
		3. Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science.
		4. Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
		5. Apply the concept of probability distribution to engineering problems & Testing hypothesis of small samples using sampling theory
		6. Apply the concepts of parametric and nonparametric tests for analyzing practical problems.
MEC402	Fluid Mechanics	1. Define properties of fluids, classify fluids and evaluate hydrostatic forces on various surfaces.
		2. Illustrate understanding of dimensional analysis of Thermal and Fluid systems.
		3. Differentiate velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow.
		4. Formulate and solve equations of the control volume for fluid flow systems and Apply Bernoulli's equation to various flow measuring devices.
		5. Calculate pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes.
		6. Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces.





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MEC403	Kinematics of Machinery	3. Draw velocity and acceleration diagrams of various mechanisms 4. Choose a cam profile for the specific follower motion 5. Predict condition for maximum power transmission in the case of a belt drive 6. Illustrate requirements for an interference-free gear pair
MEC404	CAD/CAM	1. Identify suitable computer graphics techniques for 3D modelling. 2. Transform, manipulate objects & store and manage data. 3. Develop 3D model using various types of available biomedical data. 4. Create the CAM Toolpath for specific given operations. 5. Build and create data for 3D printing of any given object using rapid prototyping and tooling processes. 6. Illustrate understanding of various cost effective alternatives for manufacturing products.
MEC405	Industrial Electronics	1. Illustrate construction, working principles and applications of power electronic switches. 2. Identify rectifiers and inverters for dc and ac motor speed control. 3. Develop circuits using OPAMP and Timer IC 555. 4. Identify digital circuits for industrial applications. 5. Demonstrate the knowledge of basic functioning of microcontrollers. 6. Analyze speed-torque characteristics of electrical machines for speed control.
MEL401	Industrial Electronics	1. Demonstrate characteristics of various electrical and electronics components 2. Develop simple applications built around these components 3. Identify use of different logic gates and their industrial applications 4. Built and demonstrate parameter measurements using microcontroller 5. Test and Analyze speed-torque characteristics of electrical machines for speed control.
MEL402	Kinematics of Machinery	1. Draw velocity diagram using Instantaneous Centre method 2. Find velocity and acceleration of a point on a four-bar mechanism by using Relative method. 3. Analyze velocity and acceleration of a specific link of a slider crank mechanism using graphical approach by Relative method. 4. Plot displacement-time, velocity-time, and acceleration-time diagrams of follower motion. 5. Draw cam profile for the specific follower motion. 6. Develop and build mechanisms to provide specific motion.
MEL403	Python Programming	1. Demonstrate understand of basic concepts of python programming. 2. Identify, install and utilize python packages 3. Develop and execute python programs for specific applications. 4. Develop and build python program to solve real-world engineering problems 5. Prepare a report on case studies selected.
MESBT 401	Skill based Lab: CNC	1. Develop and execute part programing for any given specific operation. 2. Build any given object using various CNC operations. 3. Demonstrate CAM Tool path and prepare NC- G code.





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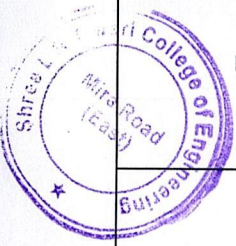
		6. Convert 2D images into 3D model
MEPBL401	Mini Project – 1B	1. Identify problems based on societal /research needs.
		2. Apply Knowledge and skill to solve societal problems in a group.
		3. Develop interpersonal skills to work as member of a group or leader.
		4. Draw the proper inferences from available results through theoretical/experimental/simulations.
		5. Analyse the impact of solutions in societal and environmental context for sustainable development.
		6. Use standard norms of engineering practices
		7. Excel in written and oral communication.
		8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.
		9. Demonstrate project management principles during project work.

MECHANICAL DEPARTMENT

THIRD YEAR

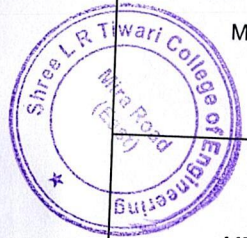
ODD SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC 501	ICE	Demonstrate the working of different systems and processes of S.I. engines
		Demonstrate the working of different systems and processes of C.I. engines
		Illustrate the working of lubrication, cooling and supercharging systems.
		Analyse engine performance
		Illustrate emission norms and emission control
		Comprehend the different technological advances in engines and alternate fuels
MEC502	Mechanical Measurement and	Classify various types of static characteristics and types of errors occurring in the system
		Classify and select proper measuring instrument for linear and angular displacement
		Classify and select proper measuring instrument for pressure and temperature measurement
		Design mathematical model of system/process for standard input responses
		Analyse error and differentiate various types of control systems and time domain specifications
		Analyse the problems associated with stability
MEC 503	Heat Transfer	Identify the three modes of heat transfer (conduction, convection and radiation).
		Illustrate basic modes of heat transfer
		Develop mathematical model for each mode of heat transfer
		Develop mathematical model for transient heat transfer
		Demonstrate and explain mechanism of boiling and condensation
		Analyse different heat exchangers and quantify their performance
MEC 504	Dynamics of Machinery	Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems
		Illustrate basic of static and dynamic forces
		Determine natural frequency of element/system
		Determine vibration response of mechanical elements / systems
		Design vibration isolation system for a specific application
		Demonstrate basic concepts of balancing of forces and couples
		Demonstrate various press working operations for mass production of sheet metal parts





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MEDLO5011	PIU	<p>Select suitable materials for different elements of press tools</p> <p>Illustrate the principles and blank development in bent &amp; drawn components</p> <p>Elaborate failure mechanisms of pressed components, safety aspects and automation in press working</p>
MEDLO5012	Machining Sciences An	<p>Calculate the values of various forces involved in the machining operations</p> <p>Design various single and multipoint cutting tools</p> <p>Analyse heat generation in machining operation and coolant operations</p> <p>Illustrate the properties of various cutting tool materials and hence select an appropriate tool material for particular machining application</p> <p>Demonstrate the inter-relationship between cutting parameters and machining performance measures like power requirement, cutting time, tool life and surface finish</p> <p>Analyse economics of machining operations</p>
MEL 501	ICE	<p>Dismantle engine assembly</p> <p>Overhaul and Assemble engine components</p> <p>Perform load test/speed test on engine setup</p> <p>Calculate performance of multi cylinder engine</p> <p>Analyse engine performance and draw heat balance sheet</p> <p>Perform exhaust gas analysis</p>
MEL 502	Technical Measurement and	<p>Calibrate displacement sensors</p> <p>Calibrate pressure and vacuum gauges</p> <p>Measure torque using strain gauges</p> <p>Identify system/process characteristics for standard input responses</p> <p>Identify various types of control systems and time domain specifications</p> <p>Analyse the problems associated with stability</p>
MEL 503	Heat Transfer	<p>Estimate thermal conductivity of metals/non metals/liquids</p> <p>Compute heat transfer coefficient in natural as well forced convection</p> <p>Measure emissivity of grey body</p> <p>Quantify fin effectiveness/efficiency</p> <p>Analyse heat exchanger performance</p> <p>Demonstrate energy balance for heat exchanger</p>
MEL 504	Dynamics of Machinery	<p>Plot and analyse governor characteristics</p> <p>Analyse gyroscopic effect on laboratory model</p> <p>Estimate natural frequency of mechanical systems</p> <p>Analyse vibration response of mechanical systems</p> <p>Determine damping coefficient of a system</p> <p>Balance rotating mass</p>
MEL 505	Manufacturing Sciences L	<p>Identify and select location and clamping faces/points on jobs.</p> <p>Design and develop simple productive and cost effective jigs and fixtures.</p> <p>Identify press tool requirements to build concepts pertaining to design of press tools.</p> <p>Select a proper force measurement method for the required machining operation.</p>



MEL506	Business Communicati	Design a technical document using precise language, suitable vocabulary and apt style.
		Develop the life skills/ interpersonal skills to progress professionally by building stronger relationships.
		Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
		Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.
Deliver formal presentations effectively implementing the verbal and non-verbal skills		

MECHANICAL DEPARTMENT

THIRD YEAR

EVEN SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC 601	logy and Quality Engine	<ol style="list-style-type: none"> <li>1. Demonstrate inspection methods and different gauges</li> <li>2. Illustrate working principle of measuring instruments and calibration methodology</li> <li>3. Illustrate basic concepts and statistical methods in quality control</li> <li>4. Demonstrate characteristics of screw threads, gear profile, and tool profile</li> <li>5. Illustrate the different sampling techniques in quality control</li> <li>6. Illustrate different nondestructive techniques used for quality evaluation</li> </ol>
MEC602	Machine Design - 1	<ol style="list-style-type: none"> <li>1 Demonstrate understanding of various design considerations</li> <li>2 Illustrate basic principles of machine design</li> <li>3 Design machine elements for statics as well as dynamic loading</li> <li>4 design machine elements on the basis of strength/rigidity concepts</li> <li>5 Use design data books in designing various components</li> <li>6 Acquire skill in preparing production drawings pertaining to various designs</li> </ol>
MEC603	Finite Element Analysis	<p>Solve differential equations using weighted residual methods</p> <p>Develop the finite element equations to model engineering problems governed by second order differential equations</p> <p>Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements</p> <p>Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements</p> <p>Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system</p> <p>Use commercial FEA software, to solve problems related to mechanical engineering</p>
MEC604	RAC	<ol style="list-style-type: none"> <li>1. Demonstrate fundamental principles of refrigeration and air conditioning</li> <li>2. Identify and locate various important components of the refrigeration and air conditioning system</li> <li>3. Illustrate various refrigeration and air conditioning processes using psychometric chart</li> <li>4. Design Air Conditioning system using cooling load calculations.</li> <li>5. Estimate air conditioning system parameters</li> <li>6. Demonstrate understanding of duct design concepts</li> </ol>

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MEDLO6021	mechatronics	4. Develop ladder logic programming 5. Design hydraulic/pneumatic circuits 6. Design a mechatronic system
MEL601	logy and Quality Engine	1. Measure linear and angular dimensions 2. Measure surface roughness 3. Measure various parameters of gear tooth profile 4. Use optical profile projector for measurement 5. Use various instruments for measurement of screw threads 6. Measure flatness by Autocollimator / Interferometry method
MEL602	Machine Design - 1	1. Design shaft under various conditions 2. Design Knuckle Joint / cotter joint 3. Design Screw Jack/C-clamp along with frame 4. Design Flexible flange couplings/ Leaf spring 5. Convert design dimensions into working/manufacturing drawing 6. Use design data book/standard codes to standardise the designed dimensions
MEL603	Finite Element Analysis	Select appropriate element for given problem Select suitable meshing and perform convergence test Select appropriate solver for given problem Interpret the result Apply basic aspects of FEA to solve engineering problems Validate FEA solution
MEL604	RAC	1. Demonstrate fundamental principles of refrigeration and air conditioning 2. Identify and locate various important components of the refrigeration and air conditioning system 3. Represent various refrigeration and air conditioning processes using psychometric chart 4. Operate and maintain refrigeration system 5. Operate and maintain air conditioning system 6. Simulate VCRS
MEL 605	Mechatronics Lab	1. Demonstrate implementation of interfacing sensors and actuators using microcontrollers 2. Demonstrate of interfacing various utilities with microcontrollers 3. Demonstrate discrete control system using PLC microcontroller 4. Design and develop a control system for specific use 5. Implement program to PLC system and demonstrate its application 6. Develop pneumatic circuits for a specific system
MEDLO6023	Industrial Automati	1. Demonstrate basics of industrial automation 2. Identify various types of automation 3. Demonstrate use of automated controls using pneumatic and hydraulic systems. 4. Illustrate the control systems in automated system. 5. Demonstrate applicability of PLC in process industry 6. Design electro-pneumatic circuits





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ODD SEMESTER		
COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC701	Machine Design II	1. Select appropriate gears for power transmission on the basis of given load and speed
		2. Design gears based on the given conditions.
		3. Select bearings for a given applications from the manufacturers catalogue.
		4. Select and/or design belts and flywheel for given applications
		5. Design cam and follower mechanisms.
		6. Design clutches and brakes
MEC702	CAD/CAM/CAE	1. Identify proper computer graphics techniques for geometric modelling.
		2. Transform, manipulate objects & store and manage data.
		3. CAM Toolpath Creation and NC- G code output.
		4. Use rapid prototyping and tooling concepts in any real life applications.
		5. Identify the tools for Analysis of a complex engineering component.
MEC703	Production Planning and Control	1. Illustrate production planning functions and manage manufacturing functions in a better way
		2. Develop competency in scheduling and sequencing of manufacturing operations
		3. Forecast the demand of the product and prepare an aggregate plan
		4. Develop the skills of Inventory Management and cost effectiveness
		5. Create a logical approach to Line Balancing in various production systems
		6. Implement techniques of manufacturing planning and control
MEDLO7032	Automobile Engineering	1. Illustrate the types and working of clutch and transmission system.
		2. Demonstrate the working of different types of final drives, steering gears and braking systems
		3. Illustrate the constructional features of wheels, tyres and suspension systems
		4. Demonstrate the understanding of types of storage, charging and starting systems
		5. Identify the type of body and chassis of an automobile
		6. Comprehend the different technological advances in automobile
MEDLO7034	Computational Fluid Dynamics	1. Demonstrate methodology to work with CFD
		2. Illustrate principles of grid generation and discretisation methods
		3. Identify and apply specific boundary conditions relevant to specific application
		4. Decide solution parameters relevant to specific application
		5. Analyze the results and draw the appropriate inferences
		6. Demonstrate basic principles of FVM
ILO 7015	Operations Research	1. Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
		2. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
		3. Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
		4. Understand the applications of integer programming and a queuing model and compute important performance measures
ILO 7018	Energy Audit and Management	1. To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
		2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
		3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities





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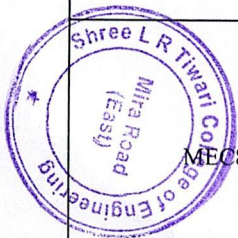
MEL701	Machine Design II	3. Design cam & followers for a given condition 4. Design clutches for a given application 5. Design brakes for given condition 6. Select bearings for a given applications from the manufacturers catalogue
MEL702	CAD/CAM/CAE	1. Identify proper computer graphics techniques for geometric modelling. 2. Transform, manipulate objects as well as store and manage data. 3. Create CAM Toolpath and prepare NC- G code 4. Apply rapid prototyping and tooling concepts in any real life applications. 5. Identify the tools for Analysis of a complex engineering component.
MEL703	Production Planning and Control	1. Prepare a process sheet 2. Prepare a Gantt Chart 3. Forecast the demand of the product and prepare an aggregate plan. 4. Perform ABC analysis of a given problem 5. Develop the skills of Inventory Management and cost effectiveness. 6. Create a logical approach to Line Balancing for various production systems.

MECHANICAL DEPARTMENT

FINAL YEAR

EVEN SEMESTER

COURSE CODE	COURSE NAME	COURSE OUTCOMES
MEC801	Design Of Mechanical System	1. Apply the concept of system design. 2. Design material handling systems such as hoisting mechanism of EOT crane, 3. Design belt conveyor systems 4. Design engine components such as cylinder, piston, connecting rod and crankshaft 5. Design pumps for the given applications 6. Prepare layout of machine tool gear box and select number of teeth on each gear
MEC802	Industrial Engineering and Management	1. Illustrate the need for optimization of resources and its significance 2. Develop ability in integrating knowledge of design along with other aspects of value addition in the conceptualization and manufacturing stage of various products. 3. Demonstrate the concept of value analysis and its relevance. 4. Manage and implement different concepts involved in method study and understanding of work content in different situations. 5. Describe different aspects of work system design and facilities design pertinent to manufacturing industries. 6. Illustrate concepts of Agile manufacturing, Lean manufacturing and Flexible manufacturing
MEL803	Power Engineering	1. Compute heat interactions in combustion of reactive mixtures 2. Differentiate boilers, boiler mountings and accessories 3. Calculate boiler efficiency and assess boiler performance 4. Demonstrate working cycles of gas turbines 5. Draw velocity triangles of impulse/reaction turbines and calculate performance parameters/efficiency





MEDLO8043	Renewable Energy System	<ol style="list-style-type: none"> <li>2. Discuss importance of renewable energy sources</li> <li>3. Discuss various renewable energy sources in Indian context</li> <li>4. Calculate and analyse utilization of solar and wind energy</li> <li>5. Illustrate design of biogas plant</li> <li>6. Demonstrate basics of hydrogen energy</li> </ol>
ILO8021	Project Management	<ol style="list-style-type: none"> <li>1. Apply selection criteria and select an appropriate project from different options.</li> <li>2. Write work break down structure for a project and develop a schedule based on it.</li> <li>3. Identify opportunities and threats to the project and decide an approach to deal with them strategically</li> <li>4. Use Earned value technique and determine &amp; predict status of the project.</li> <li>5. Capture lessons learned during project phases and document them for future reference</li> </ol>
ILO8029	Environmental Management	<ol style="list-style-type: none"> <li>1. Understand the concept of environmental management</li> <li>2. Understand ecosystem and interdependence, food chain etc.</li> <li>3. Understand and interpret environment related legislations</li> </ol>
MEL801	Design Of Mechanical System	<ol style="list-style-type: none"> <li>1. Apply the concept of system design.</li> <li>2. Design of hoisting mechanism of EOT crane,</li> <li>3. Design belt conveyor systems</li> <li>4. Design pumps for the given applications</li> <li>5. Design engine components such as cylinder, piston, connecting rod and crankshaft</li> <li>6. Design of machine tool gearbox</li> </ol>
MEL803	Power Engineering	<ol style="list-style-type: none"> <li>1. Differentiate boilers</li> <li>2. Differentiate boiler mountings and accessories</li> <li>3. Conduct a trial on impulse turbine and analyse its performance</li> <li>4. Conduct a trial on reaction turbine and analyse its performance</li> <li>5. Conduct a trial on Centrifugal pump and analyse its performance</li> <li>6. Conduct a trial on Reciprocating pump and analyse its performance</li> </ol>

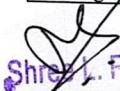
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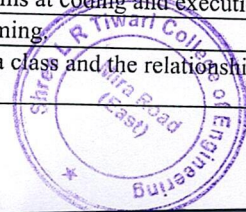




## INFORMATION TECHNOLOGY DEPARTMENT

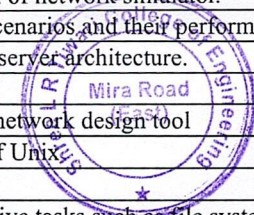
Course Code	Course Name	Course Outcome
ITC301	Engineering Mathematics -III	<ol style="list-style-type: none"> <li>1. To familiarize with the Laplace Transform, Inverse Laplace Transform of various functions, and applications.</li> <li>2. To acquaint with the concept of Fourier series, its complex form and enhance the problem solving.</li> <li>3. To familiarize the concept of complex variables, C-R equations with applications.</li> <li>4. The fundamental knowledge of Trees, Graphs etc.</li> <li>5. To study the basic techniques of statistics like correlation, regression and curve fitting for data Machine learning and AI.</li> <li>6. To understand some advanced topics of probability, random variables with their distributions and expectations.</li> </ol>
ITC302	Data Structure and Analysis	<ol style="list-style-type: none"> <li>1. Classify and Apply the concepts of stacks, queues and linked list in real life problem solving.</li> <li>2. Classify, apply and analyze the concepts trees in real life problem solving.</li> <li>3. Illustrate and justify the concepts of graphs in real life problem solving.</li> <li>4. List and examine the concepts of sorting, searching techniques in real life problem solving.</li> <li>5. Use and identify the concepts of recursion, hashing in real life problem solving.</li> <li>6. Examine and justify different methods of stacks, queues, linked list, trees and graphs to various applications.</li> </ol>
ITC303	DataBase Management System	<ol style="list-style-type: none"> <li>1. Identify the need of Database Management System.</li> <li>2. Design conceptual model for real life applications.</li> <li>3. Create Relational Model for real life applications</li> <li>4. Formulate query using SQL commands.</li> <li>5. Apply the concept of normalization to relational database design.</li> <li>6. Demonstrate the concept of transaction, concurrency and recovery.</li> </ol>
ITC304	Principle of Communication	<ol style="list-style-type: none"> <li>1. Describe analog and digital communication systems</li> <li>2. Differentiate types of noise, analyses the Fourier transform of time and frequency domain.</li> <li>3. Design transmitter and receiver of AM, DSB, SSB and FM.</li> <li>4. Describe Sampling theorem and pulse modulation systems.</li> <li>5. Explain multiplexing and digital band pass modulation techniques.</li> <li>6. Describe electromagnetic radiation and propagation of waves.</li> </ol>
ITC305	Paradigms and Computer Paradigms Fundamentals	<ol style="list-style-type: none"> <li>1. Understand and Compare different programming paradigms.</li> <li>2. Understand the Object Oriented Constructs and use them in program design.</li> <li>3. Understand the concepts of declarative programming paradigms through functional and logic programming.</li> <li>4. Design and Develop programs based on declarative programming paradigm using functional and logic programming.</li> <li>5. Understand role of concurrency in parallel and distributed programming.</li> <li>6. Understand different application domains for use of scripting languages.</li> </ol>
ITL301	Data Structure Lab	<ol style="list-style-type: none"> <li>1. Understand and use the basic concepts and principles of various linked lists, stacks and queues</li> <li>2. Understand the concepts and apply the methods in basic trees.</li> <li>3. Use and identify the methods in advanced trees.</li> <li>4. Understand the concepts and apply the methods in graphs.</li> <li>5. Understand the concepts and apply the techniques of searching, hashing and sorting</li> <li>6. Illustrate and examine the methods of linked lists, stacks, queues, trees and</li> </ol>
ITL302	SQL Lab	<ol style="list-style-type: none"> <li>1. Define problem statement and Construct the conceptual model for real life application.</li> <li>2. Create and populate a RDBMS using SQL.</li> <li>3. Formulate and write SQL queries for efficient information retrieval</li> <li>4. Apply view, triggers and procedures to demonstrate specific event handling.</li> <li>5. Demonstrate database connectivity using JDBC.</li> <li>6. Demonstrate the concept of concurrent transactions.</li> </ol>
ITL303	Computer programming Paradigms Lab	<ol style="list-style-type: none"> <li>1. Apply Object Oriented concepts in C++.</li> <li>2. Design and Develop solution based on declarative programming paradigm using functional and programming using Haskell.</li> <li>3. Understand the multithreaded programs in Java and C++</li> <li>4. Understand the need and use of exception handling and garbage collection in C++ and Java</li> <li>5. Design and Develop a solution to the same problem using multiple paradigms.</li> <li>6. Compare the implementations in multiple paradigms at coding and execution level</li> </ol>
		<ol style="list-style-type: none"> <li>1. Explain the fundamental concepts of Java Programming</li> <li>2. Use the concepts of classes, objects, members of a class and the relationships among them need finding the solution to specific problem.</li> </ol>

  
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 Kanakiya Park, Mira Road (E).





ITL304	Java Lab (SBL)	<p>3. Demonstrate how to extend java classes and achieve reusability using Inheritance, Interface and Packages.</p> <p>4. Construct robust and faster programmed solutions to problems using concept of Multithreading exceptions and file handling</p> <p>5. Design and develop Graphical User Interface using Abstract Window Toolkit and Swings along response to the events.</p> <p>6. Develop Graphical User Interface by exploring JavaFX framework based on MVC architecture</p>
ITM301	Mini Project – 1 A Front end /backend Application using JAVA	<p>1. Identify problems based on societal /research needs.</p> <p>2. Apply Knowledge and skill to solve societal problems in a group.</p> <p>3. Develop interpersonal skills to work as member of a group or leader.</p> <p>4. Draw the proper inferences from available results through theoretical/ experimental/simulation</p> <p>5. Analyse the impact of solutions in societal and environmental context for sustainable development</p> <p>6. Use standard norms of engineering practices</p> <p>7. Excel in written and oral communication.</p> <p>8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.</p> <p>9. Demonstrate project management principles during project work.</p>
ITC401	Engineering Mathematics-IV	<p>1. Apply the concepts of eigenvalues and eigenvectors in engineering problems.</p> <p>2. Use the concepts of Complex Integration for evaluating integrals, computing residues &amp; evaluate various contour integrals.</p> <p>3. Apply the concept of Z- transformation and inverse in engineering problems.</p> <p>4. Use the concept of probability distribution and sampling theory to engineering problems.</p> <p>5. Apply the concept of Linear Programming Problems to optimization.</p> <p>6. Solve Non-Linear Programming Problems for optimization of engineering problems.</p>
ITC402	Computer Networks and Network Design	<p>1. Describe the functionalities of each layer of the models and compare the Models.</p> <p>2. Categorize the types of transmission media and explain data link layer concepts, design issues protocols.</p> <p>3. Analyze the routing protocols and assign IP address to networks.</p> <p>4. Explain the data transportation and session management issues and related protocols used for delivery of data.</p> <p>5. List the data presentation techniques and illustrate the client/server model in application layer</p> <p>6. Use of networking concepts of IP address, Routing, and application services to design a network organization</p>
ITC403	Operating System	<p>1. Understand the basic concepts related to Operating System.</p> <p>2. Describe the process management policies and illustrate scheduling of processes by CPU.</p> <p>3. Explain and apply synchronization primitives and evaluate deadlock conditions as handled by OS System.</p> <p>4. Describe and analyze the memory allocation and management functions of Operating System.</p> <p>5. Analyze and evaluate the services provided by Operating System for storage management.</p> <p>6. Compare the functions of various special-purpose Operating Systems.</p>
ITC404	Automata Theory	<p>1. Explain, analyze and design Regular languages, Expression and Grammars.</p> <p>2. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.</p> <p>3. Analyze and design Context Free languages and Grammars.</p> <p>4. Design different types of Push down Automata as Simple Parser.</p> <p>5. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.</p> <p>6. Develop understanding of applications of various Automata.</p>
ITC405	Computer Organization and Architecture	<p>1. Demonstrate the fundamentals of Digital Logic Design</p> <p>2. Describe basic organization of computer, the architecture of 8086 microprocessor and implement assembly language programming for 8086 microprocessors.</p> <p>3. Demonstrate control unit operations and conceptualize instruction level parallelism.</p> <p>4. List and Identify integers and real numbers and perform computer arithmetic operations on integers</p> <p>5. Categorize memory organization and explain the function of each element of a memory hierarchy</p> <p>6. Examine different methods for computer I/O mechanism.</p>
ITL401	Network Lab	<p>1. Execute and evaluate network administration commands and demonstrate their use in different scenarios</p> <p>2. Demonstrate the installation and configuration of network simulator.</p> <p>3. Demonstrate and measure different network scenarios and their performance behavior.</p> <p>4. Implement the socket programming for client server architecture.</p> <p>5. Analyze the traffic flow of different protocols</p> <p>6. Design a network for an organization using a network design tool</p>
		<p>1. Understand the architecture and functioning of Unix</p> <p>2. Identify the Unix general purpose commands</p> <p>3. Apply Unix commands for system administrative tasks such as file system management and user management.</p>

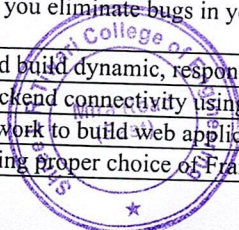




ITL402	Unix Lab	<ol style="list-style-type: none"> <li>Execute Unix commands for system administrative tasks such as process management and memory management</li> <li>Implement basic shell scripts for different applications.</li> <li>Implement advanced scripts using awk &amp; perl languages and grep, sed, etc. commands for performing various tasks.</li> </ol>
ITL403	Microprocessor Lab	<ol style="list-style-type: none"> <li>Demonstrate various components and peripheral of computer system</li> <li>Analyze and design combinational circuits</li> <li>Build a program on a microprocessor using arithmetic &amp; logical instruction set of 8086.</li> <li>Develop the assembly level programming using 8086 loop instruction set</li> <li>Write programs based on string and procedure for 8086 microprocessor.</li> <li>Design interfacing of peripheral devices with 8086 microprocessor.</li> </ol>
ITL404	Python Lab(SBL)	<ol style="list-style-type: none"> <li>Understand the structure, syntax, and semantics of the Python language.</li> <li>Interpret advanced data types and functions in python</li> <li>illustrate the concepts of object-oriented programming as used in Python</li> <li>Create Python applications using modules, packages, multithreading and exception handling.</li> <li>Gain proficiency in writing File Handling programs ,also create GUI applications and evaluate operations in python.</li> <li>Design and Develop cost-effective robust applications using the latest Python trends and techniques.</li> </ol>
ITM401	Mini Project – 1 B for Python based automation projects	<ol style="list-style-type: none"> <li>Identify problems based on societal /research needs.</li> <li>Apply Knowledge and skill to solve societal problems in a group.</li> <li>Develop interpersonal skills to work as member of a group or leader.</li> <li>Draw the proper inferences from available results through theoretical/ experimental/simulation</li> <li>Analyse the impact of solutions in societal and environmental context for sustainable development</li> <li>Use standard norms of engineering practices</li> <li>Excel in written and oral communication.</li> <li>Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>Demonstrate project management principles during project work.</li> </ol>
ITC501	Internet Programming	<ol style="list-style-type: none"> <li>Select protocols or technologies required for various web applications.</li> <li>Apply JavaScript to add functionality to web pages.</li> <li>Design front end application using basic React.</li> <li>Design front end applications using functional components of React.</li> <li>Design back-end applications using Node.js.</li> <li>Construct web based Node.js applications using Express.</li> </ol>
ITC502	Computer Network Security	<ol style="list-style-type: none"> <li>Explain the fundamentals concepts of computer security and network security.</li> <li>Identify the basic cryptographic techniques using classical and block encryption methods.</li> <li>Study and describe the system security malicious software.</li> <li>Describe the Network layer security, Transport layer security and application layer security.</li> <li>Explain the need of network management security and illustrate the need for NAC.</li> <li>Identify the function of an IDS and firewall for the system security.</li> </ol>
ITC503	Entrepreneurship and E-Business	<ol style="list-style-type: none"> <li>Understand the concept of entrepreneurship and its close relationship with enterprise and own management.</li> <li>Understand the nature of business development in the context of existing organizations and of business start-ups.</li> <li>Comprehended important factors for starting a new venture and business development.</li> <li>Know issues and decisions involved in financing and resourcing a business start-up</li> <li>Describe various E-business Models</li> <li>Discuss various E-business Strategies.</li> </ol>
ITC504	Software Engineering	<ol style="list-style-type: none"> <li>Understand and use basic knowledge in software engineering.</li> <li>Identify requirements, analyze and prepare models.</li> <li>Plan, schedule and track the progress of the projects.</li> <li>Design &amp; develop the software solutions for the growth of society</li> <li>To demonstrate and evaluate real time projects with respect to software engineering principles</li> <li>Apply testing and assure quality in software solution</li> </ol>
ITL501	Internet Programming Lab	<ol style="list-style-type: none"> <li>Identify and apply the appropriate HTML tags to develop a webpage.</li> <li>Identify and apply the appropriate CSS tags to format data on webpage</li> <li>Construct responsive websites using Bootstrap</li> <li>Use JavaScript to develop interactive web pages.</li> <li>Construct front end applications using React</li> <li>Construct back end applications using Node.js/Express</li> </ol>
ITL502	Security Lab	<ol style="list-style-type: none"> <li>Illustrate symmetric cryptography by implementing classical ciphers.</li> <li>Demonstrate Key management, distribution and user authentication.</li> <li>Explore the different network reconnaissance tools to gather information about networks</li> <li>Use tools like sniffers, port scanners and other related tools for analyzing packets in a network</li> </ol>

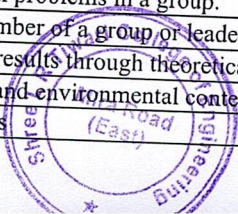


		<ul style="list-style-type: none"> <li>5. Use open-source tools to scan the network for vulnerabilities and simulate attacks.</li> <li>6. Demonstrate the network security system using open source tools.</li> </ul>
ITL503	DevOps	<ul style="list-style-type: none"> <li>1. To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements</li> <li>2. To obtain complete knowledge of the “version control system” to effectively track changes au with Git and GitHub</li> <li>3. To understand the importance of Jenkins to Build and deploy Software Applications on server environment</li> <li>4. Understand the importance of Selenium and Jenkins to test Software Applications</li> <li>5. To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker</li> <li>6. To Synthesize software configuration and provisioning using Ansible.</li> </ul>
ITL504	Advance DevOps Lab	<ul style="list-style-type: none"> <li>1. To understand the fundamentals of Cloud Computing and be fully proficient with Cloud based solution deployment options to meet your business requirements</li> <li>2. To deploy single and multiple container applications and manage application deployments wit in Kubernetes</li> <li>3. To apply best practices for managing infrastructure as code environments and use terraform to and deploy cloud</li> <li>4. To identify and remediate application vulnerabilities earlier and help integrate security in the development process using SAST Techniques.</li> <li>5. To use Continuous Monitoring Tools to resolve any system errors (low memory, unreachable s etc.) before they have any negative impact on the business productivity</li> <li>6. To engineer a composition of nano services using AWS Lambda and Step Functions with the S Framework</li> </ul>
ITL505	Business Communication and Ethics - II	<ul style="list-style-type: none"> <li>1. plan and prepare effective business/ technical documents which will in turn provide solid found their future managerial roles.</li> <li>2. strategize their personal and professional skills to build a professional image and meet the dem the industry.</li> <li>3. emerge successful in group discussions, meetings and result-oriented agreeable solutions in gr communication situations.</li> <li>4. deliver persuasive and professional presentations.</li> <li>5. develop creative thinking and interpersonal skills required for effective professional communic</li> <li>6. apply codes of ethical conduct, personal integrity and norms of organizational behaviour</li> </ul>
ITM501	Mini Project – 2 A Web Based Business Model	<ul style="list-style-type: none"> <li>1. Identify problems based on societal /research needs.</li> <li>2. Apply Knowledge and skill to solve societal problems in a group.</li> <li>3. Develop interpersonal skills to work as member of a group or leader.</li> <li>4. Draw the proper inferences from available results through theoretical/ experimental/simulation</li> <li>5. Analyse the impact of solutions in societal and environmental context for sustainable developn</li> <li>6. Use standard norms of engineering practices</li> <li>7. Excel in written and oral communication.</li> <li>8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>9. Demonstrate project management principles during project work.</li> </ul>
ITDO5014	Advance Data Structure and Analysis	<ul style="list-style-type: none"> <li>1. Understand the different methods for analysis of algorithms.</li> <li>2. Choose an appropriate advanced data structure to solve a specific problem.</li> <li>3. Apply an appropriate algorithmic design approach for a given problem.</li> <li>4. Apply the dynamic programming technique to solve a given problem.</li> <li>5. Select an appropriate pattern matching algorithm for a given application.</li> <li>6. Understand the concepts of Optimization, Approximation and Parallel computing algorithms.</li> </ul>
ITC601	Data Mining and Business Intelligence	<ul style="list-style-type: none"> <li>1. Demonstrate an understanding of the importance of data warehousing and data mining and the principles of business intelligence. 1</li> <li>2. Organize and prepare the data needed for data mining using pre preprocessing techniques.</li> <li>3. Perform exploratory analysis of the data to be used for mining.</li> <li>4. Implement the appropriate data mining methods like classification, clustering or Frequent Patt mining on large data sets.</li> <li>5. Define and apply metrics to measure the performance of various data mining algorithms</li> <li>6. Apply BI to solve practical problems: Analyze the problem domain, use the data collected in er apply the appropriate data mining technique, interpret and visualize the results and provide decis support.</li> </ul>
ITC602	Web X.0	<ul style="list-style-type: none"> <li>1. Understand the basic concepts related to web analytics and semantic web.</li> <li>2. Understand how TypeScript can help you eliminate bugs in your code and enable you to scale code.</li> <li>3. Understand AngularJS framework and build dynamic, responsive single-page web application</li> <li>4. Apply MongoDB for frontend and backend connectivity using REST API.</li> <li>5. Apply Flask web development framework to build web applications with less code.</li> <li>6. Develop Rich Internet Application using proper choice of Framework.</li> </ul>



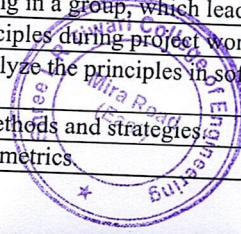


ITC603	Wireless Technology	<ol style="list-style-type: none"> <li>1. Describe the basic concepts of Wireless Network and Wireless Generations.</li> <li>2. Demonstrate and Evaluate the various Wide Area Wireless Technologies.</li> <li>3. Analyze the prevalent IEEE standards used for implementation of WLAN and WMAN Techno</li> <li>4. Appraise the importance of WPAN, WSN and Ad-hoc Networks.</li> <li>5. Analyze various Wireless Network Security Standards.</li> <li>6. Review the design considerations for deploying the Wireless Network Infrastructure.</li> </ol>
ITC604	AI and DS-I	<ol style="list-style-type: none"> <li>1. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent</li> <li>2. Apply an appropriate problem-solving method and knowledge-representation scheme.</li> <li>3. Develop an ability to analyze and formalize the problem (as a state space, graph, etc.). They wi</li> <li>4. Apply problem solving concepts with data science and will be able to tackle them from a statis</li> <li>5. Choose and apply appropriately from a wider range of exploratory and inferential methods for</li> <li>6. Understand and apply types of machine learning methods for real world problems.</li> </ol>
ITL601	Business Intelligence Lab	<ol style="list-style-type: none"> <li>1. Identify sources of Data for mining and perform data exploration</li> <li>2. Organize and prepare the data needed for data mining algorithms in terms of attributes and cla</li> <li>3. Implement the appropriate data mining methods like classification, clustering or association m</li> <li>4. Implement various data mining algorithms from scratch using languages like Python/ Java etc.</li> <li>5. Evaluate and compare performance of some available BI packages</li> <li>6. Apply BI to solve practical problems: Analyze the problem domain, use the data collected in er</li> </ol>
ITL602	Web lab	<ol style="list-style-type: none"> <li>1. Understand open source tools for web analytics and semantic web apps development and depl</li> <li>2. Understand the basic concepts of TypeScript for designing web applications.</li> <li>3. Implement Single Page Applications using AngularJS Framework.</li> <li>4. Develop Rich Internet Applications using AJAX.</li> <li>5. Create REST Web services using MongoDB.</li> <li>6. Design web applications using Flask.</li> </ol>
ITL603	Sensor lab	<ol style="list-style-type: none"> <li>1. Differentiate between various wireless communication technologies based on the range of</li> <li>2. Conduct a literature survey of sensors used in real world wireless applications.</li> <li>3. Demonstrate the simulation of WSN using the Network Simulators (Contiki/ Tinker CAD/ Cu</li> <li>4. Demonstrate and build the project successfully by hardware/sensor requirements, coding, (</li> <li>5. Report and present the findings of the study conducted in the preferred domain.</li> <li>6. Demonstrate the ability to work in teams and manage the conduct of the research study.</li> </ol>
ITL604	MAD &PWA Lab	<ol style="list-style-type: none"> <li>1. Understand cross platform mobile application development using Flutter framework</li> <li>2. Design and Develop interactive Flutter App by using widgets, layouts, gestures and animation</li> <li>3. Analyze and Build production ready Flutter App by incorporating backend services and deploy</li> <li>4. Understand various PWA frameworks and their requirements</li> <li>5. Design and Develop a responsive User Interface by applying PWA Design techniques</li> <li>6. Develop and Analyse PWA Features and deploy it over app hosting solutions</li> </ol>
ITL605	DS using Python Lab	<ol style="list-style-type: none"> <li>1. Understand the concept of Data science process and associated terminologies to solve real-wo</li> <li>2. Analyze the data using different statistical techniques and visualize the outcome using differen</li> <li>3. Analyze and apply the supervised machine learning techniques like Classification, Regression</li> <li>4. Apply the different unsupervised machine learning algorithms like Clustering, Decision Trees,</li> <li>5. Design and Build an application that performs exploratory data analysis using Apache Spark</li> <li>6. Design and develop a data science application that can have data acquisition, processing, visua</li> </ol>
ITM601	Mini Project – 2 B Web Based on ML	<ol style="list-style-type: none"> <li>1. Identify problems based on societal /research needs.</li> <li>2. Apply Knowledge and skill to solve societal problems in a group.</li> <li>3. Develop interpersonal skills to work as member of a group or leader.</li> <li>4. Draw the proper inferences from available results through theoretical/ experimental/simulation</li> <li>5. Analyse the impact of solutions in societal and environmental context for sustainable developm</li> <li>6. Use standard norms of engineering practices</li> </ol>



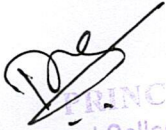


		<ol style="list-style-type: none"> <li>Excel in written and oral communication.</li> <li>Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>Demonstrate project management principles during project work</li> </ol>
ITDO6013	Green IT	<ol style="list-style-type: none"> <li>Describe awareness among stakeholders and promote green agenda and green initiatives in the working environments leading to green movement</li> <li>Identify IT Infrastructure Management and Green Data Centre Metrics for software development</li> <li>Recognize Objectives of Green Network Protocols for Data communication.</li> <li>Use Green IT Strategies and metrics for ICT development.</li> <li>Illustrate various green IT services and its roles.</li> <li>Use new career opportunities available in IT profession, audits and others with special skills such as energy efficiency, ethical IT assets disposal, carbon footprint estimation, reporting and development of green products, applications and services.</li> </ol>
ITC701	AI and DS – II	<ol style="list-style-type: none"> <li>Design models for reasoning with uncertainty as well as the use of unreliable information.</li> <li>Analyze the process of building a Cognitive application.</li> <li>Design fuzzy controller system.</li> <li>Apply learning concepts to develop real life applications.</li> <li>Evaluate performance of learning algorithms.</li> <li>Analyze current trends in Data Science.</li> </ol>
ITC702	Internet of Everything	<ol style="list-style-type: none"> <li>Describe the Characteristics and Conceptual Framework of IoT.</li> <li>Differentiate between the levels of the IoT architectures.</li> <li>Analyze the IoT access technologies.</li> <li>Illustrate various edge to cloud protocol for IoT.</li> <li>Apply IoT analytics and data visualization.</li> <li>Analyze and evaluate IoT applications.</li> </ol>
ITL701	Data Science Lab	<ol style="list-style-type: none"> <li>Implement reasoning with uncertainty.</li> <li>Explore use cases of Cognitive Computing</li> <li>Implement a fuzzy controller system.</li> <li>Develop real life applications using learning concepts.</li> <li>Evaluate performance of applications.</li> <li>Implement and analyze applications based on current trends in Data Science.</li> </ol>
ITL702	Internet of Everything Lab	<ol style="list-style-type: none"> <li>Identify the requirements for the real world problems.</li> <li>Conduct a survey of several available literatures in the preferred field of study.</li> <li>Study and enhance software/ hardware skills.</li> <li>Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulation and testing.</li> <li>To report and present the findings of the study conducted in the preferred domain.</li> <li>Demonstrate an ability to work in teams and manage the conduct of the research study.</li> </ol>
ITL703	Secure Application Development	<ol style="list-style-type: none"> <li>Apply secure programming of application code.</li> <li>Understand the Owasp methodologies and standards.</li> <li>Identify main vulnerabilities inherent in applications.</li> <li>Apply Data Validation and Authentication for application</li> <li>Apply Security at Session Layer Management</li> <li>Apply secure coding for cryptography.</li> </ol>
ITL704	Recent Open Source Project Lab	<ol style="list-style-type: none"> <li>Understand and apply the basic concepts of Open Source Software.</li> <li>Identify the difference between the GPL(General Public Licence) and Contribute to Open Source</li> <li>Apply and evaluate your knowledge for the Contribute to Open Source in different Operating Systems</li> <li>Apply and evaluate your knowledge for the Contribute to Open Source in different Technologies</li> <li>Apply and evaluate your knowledge for the Contribute to Open Source in different Network Architectures</li> <li>Apply and evaluate your knowledge for the Contribute to Open Source in different Application Services.</li> </ol>
ITM701	Major Project – I	<ol style="list-style-type: none"> <li>Identify problems based on societal /research needs.</li> <li>Apply Knowledge and skill to solve societal problems in a group.</li> <li>Develop interpersonal skills to work as member of a group or leader.</li> <li>Draw the proper inferences from available results through theoretical/ experimental/simulation</li> <li>Analyse the impact of solutions in societal and environmental context for sustainable development</li> <li>Use standard norms of engineering practices</li> <li>Excel in written and oral communication.</li> <li>Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>Demonstrate project management principles during project work.</li> </ol>
ITDO7014	Software Testing and QA	<ol style="list-style-type: none"> <li>Investigate the reason for bugs and analyze the principles in software testing to prevent and rework bugs.</li> <li>Understand various software testing methods and strategies.</li> <li>Manage the testing process and testing metrics.</li> </ol>






		<ul style="list-style-type: none"> <li>4. Understand fundamental concepts of software automation and use automation tools.</li> <li>5. Apply the software testing techniques in the real time environment.</li> <li>6. Use practical knowledge of a variety of ways to test software and quality attributes.</li> </ul>
ILO7017	Disaster Management and Mitigation Measures	<ul style="list-style-type: none"> <li>1. Get to know natural as well as manmade disaster and their extent and possible effects on the ec</li> <li>2. Plan of national importance structures based upon the previous history.</li> <li>3. Get acquainted with government policies, acts and various organizational structure associated v</li> <li>emergency.</li> <li>4. Get to know the simple do's and don'ts in such extreme events and act accordingly</li> </ul>
ITC801	Blockchain and DLT	<ul style="list-style-type: none"> <li>1. Describe the basic concept of Blockchain and Distributed Ledger Technology.</li> <li>2. Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions.</li> <li>3. Implement smart contracts in Ethereum using different development frameworks.</li> <li>4. Develop applications in permissioned Hyperledger Fabric network.</li> <li>5. Interpret different Crypto assets and Crypto currencies</li> <li>6. Analyze the use of Blockchain with AI, IoT and Cyber Security using case studies.</li> </ul>
ITL801	Blockchain Lab	<ul style="list-style-type: none"> <li>1. Develop and test smart contract on local Blockchain.</li> <li>2. Develop and test smart contract on Ethereum test networks.</li> <li>3. Write and deploy smart contract using Remix IDE and Metamask.</li> <li>4. Design and develop Cryptocurrency.</li> <li>5. Write and deploy chain code in Hyperledger Fabric.</li> <li>6. Develop and test a Full-fledged DApp using Ethereum/Hyperledger.</li> </ul>
ITL802	Cloud Computing	<ul style="list-style-type: none"> <li>1. Implement different types of virtualization techniques.</li> <li>2. Analyze various cloud computing service models and implement them to solve the given probl</li> <li>3. Design and develop real world web applications and deploy them on commercial cloud(s).</li> <li>4. Explain major security issues in the cloud and mechanisms to address them.</li> <li>5. Explore various commercially available cloud services and recommend the appropriate one for application.</li> <li>6. Implement the concept of containerization.</li> </ul>
ITM701	Major Project– II	<ul style="list-style-type: none"> <li>1. Identify problems based on societal /research needs.</li> <li>2. Apply Knowledge and skill to solve societal problems in a group.</li> <li>3. Develop interpersonal skills to work as member of a group or leader.</li> <li>4. Draw the proper inferences from available results through theoretical/ experimental/simulation</li> <li>5. Analyse the impact of solutions in societal and environmental context for sustainable developm</li> <li>6. Use standard norms of engineering practices</li> <li>7. Excel in written and oral communication.</li> <li>8. Demonstrate capabilities of self-learning in a group, which leads to life long learning.</li> <li>9. Demonstrate project management principles during project work.</li> </ul>
ITDO8011	Big Data Analytics	<ul style="list-style-type: none"> <li>1. Explain the motivation for big data systems and identify the main sources of Big Data in the re</li> <li>2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store, retrieve an</li> <li>Big Data for analytics.</li> <li>3. Implement several Data Intensive tasks using the Map Reduce Paradigm.</li> <li>4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data</li> <li>5. Design algorithms to analyze Big data like streams, Web Graphs and Social Media data.</li> <li>6. Design and implement successful Recommendation engines for enterprises.</li> </ul>
ITDO8021	User Interface Design	<ul style="list-style-type: none"> <li>1. Identify and criticize bad features of interface designs.</li> <li>2. Predict good features of interface designs.</li> <li>3. Illustrate and analyze user needs and formulate user design specifications.</li> <li>4. Interpret and evaluate the data collected during the process.</li> <li>5. Evaluate designs based on theoretical frameworks and methodological approaches.</li> <li>6. Apply better techniques to improve the user interaction design interfaces.</li> </ul>
ILO8019	Environmental Management	<ul style="list-style-type: none"> <li>1. Understand the concept of environmental management</li> <li>2. Understand ecosystem and interdependence, food chain etc.</li> <li>3. Understand and interpret environment related legislations</li> </ul>

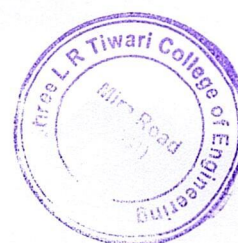
  
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 Kanakya Park, Mira Road (E).





HUMANITIES & APPLIED SCIENCES		ODD SEMESTER
Course code	Course Name	Course Outcomes
FEC101	<b>ENGINEERING MATHEMATICS-I</b>	Learners will be able to... 1. Illustrate the basic concepts of Complex numbers. 2. Apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic function. 3. Illustrate the basic principles of Partial differentiation. 4. Illustrate the knowledge of Maxima, Minima and Successive differentiation. 5. Apply principles of basic operations of matrices, rank and echelon form of matrices to solve simultaneous equations. 6. Illustrate SCILAB programming techniques to the solution of linear and simultaneous algebraic equations.
FEC102	<b>ENGINEERING PHYSICS - I</b>	Learners will be able to... 1. Illustrate the fundamentals of quantum mechanics and its application. 2. Explain peculiar properties of crystal structure and apply them in crystallography using X-ray diffraction techniques. 3. Comprehend the concepts of semiconductor physics and applications of semiconductors in electronic devices. 4. Employ the concept of interference in thin films in measurements. 5. Discuss the properties of Superconductors and Super capacitors to apply them in novel applications. 6. Compare the properties of engineering materials for their current and futuristic frontier applications.
FEC103	<b>ENGINEERING CHEMISTRY - I</b>	Learners will be able to... 1. Explain the concept of microscopic chemistry in terms of atomic and molecular orbital theory and relate it to diatomic molecules. 2. Describe the concept of aromaticity and interpret it with relation to specific aromatic systems. 3. Illustrate the knowledge of various types of intermolecular forces and relate it to real gases. 4. Interpret various phase transformations using thermodynamics. 5. Illustrate the knowledge of polymers, fabrication methods, conducting polymers in various industrial fields. 6. Analyze the quality of water and suggest suitable methods of treatment.

  
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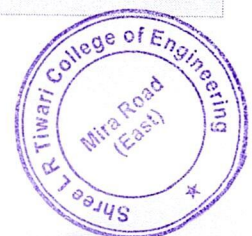




<b>HUMANITIES &amp; APPLIED SCIENCES</b>		<b>ODD SEMESTER</b>
<b>Course code</b>	<b>Course Name</b>	<b>Course Outcomes</b>
<b>FEC104</b>	<b>ENGINEERING MECHANICS</b>	Learners will be able to... 1. Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD. 2. Demonstrate the understanding of Centroid and its significance and locate the same. . Correlate real life application to specific type of friction and estimate required force to overcome friction. 4. Establish relation between velocity and acceleration of a particle and analyze the motion by plotting the relation 5. Illustrate different types of motions and establish Kinematic relations for a rigid body 6. Analyze particles in motion using force and acceleration, work-energy and impulse momentum principles
<b>FEC105</b>	<b>BASIC ELECTRICAL ENGINEERING</b>	Learner will be able to... 1. Apply various network theorems to determine the circuit response / behavior. 2. Evaluate and analyze 1- $\Phi$ circuits. 3. Evaluate and analyze 3- $\Phi$ AC circuits. 4. Understand the constructional features and operation of 1- $\Phi$ transformer. 5. Illustrate the working principle of 3- $\Phi$ machine. 6. Illustrate the working principle of 1- $\Phi$ machines.
<b>FEL101</b>	<b>ENGINEERING PHYSICS - I</b>	Learners will be able to... 1. Perform the experiments based on interference in thin films and analyze the results. 2. Verify the theory learned in the module crystallography. 3. Perform the experiments on various semiconductor devices and analyze their characteristics. 4. Perform simulation study on engineering materials.
<b>FEL102</b>	<b>ENGINEERING CHEMISTRY - I</b>	Learners will be able to... 1. Determine Chloride content and hardness of water sample 2. Determine free acid ph of different solutions 3. Determine metal ion concentration . Synthesize polymers, biodegradable plastics. 5. Determine Viscosity of oil
<b>FEL103</b>	<b>ENGINEERING MECHANICS</b>	Learners will be able to... 1. Verify equations of equilibrium of coplanar force system 2. Verify law of moments. 3. Determine the centroid of plane lamina. 4. Evaluate co-efficient of friction between the different surfaces in contact.




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		<p>5. Demonstrate the types of collision/impact and determine corresponding coefficient of restitution.</p> <p>6. Differentiate the kinematics and kinetics of a particle.</p>
<b>HUMANITIES &amp; APPLIED SCIENCES</b>		<b>ODD SEMESTER</b>
<b>Course code</b>	<b>Course Name</b>	<b>Course Outcomes</b>
<b>FEL104</b>	<b>BASIC ELECTRICAL ENGINEERING</b>	<p>Learners will be able to...</p> <ol style="list-style-type: none"> <li>1. Interpret and analyse the behaviour of DC circuits using network theorems.</li> <li>2. Perform and infer experiment on single phase AC circuits.</li> <li>3. Demonstrate experiment on three phase AC circuits.</li> <li>4. Illustrate the performance of single phase transformer and machines.</li> </ol>
<b>FEL105</b>	<b>BASIC WORKSHOP PRACTICE – I</b>	<p>Learners will be able to...</p> <ol style="list-style-type: none"> <li>1. Develop the necessary skill required to handle/use different fitting tools.</li> <li>2. Develop skill required for hardware maintenance.</li> <li>3. Able to install an operating system and system drives.</li> <li>4. Able to identify the network components and perform basic networking and crimping.</li> <li>5. Able to prepare the edges of jobs and do simple arc welding.</li> <li>6. Develop the necessary skill required to handle/use different plumping tools.</li> <li>7. Demonstrate the turning operation with the help of a simple job.</li> </ol>
		<b>EVEN SEMESTER</b>
<b>FEC201</b>	<b>ENGINEERING MATHEMATICS-II</b>	<p>Learners will be able to...</p> <ol style="list-style-type: none"> <li>1. Solve various types of First Order differential equation.</li> <li>2. Solve various types of Higher Order Differential equation.</li> <li>3. Illustrate the concepts of Beta and Gamma function, DUIS and rectification.</li> <li>4. Apply the concepts of Double integral</li> <li>5. Apply the concept of Triple integral.</li> <li>6. Apply the principles of Numerical Method for solving differential equation and numerical integration analytically and using Scilab also.</li> </ol>
<b>FEC202</b>	<b>ENGINEERING PHYSICS – II</b>	<p>Learners will be able to...</p> <ol style="list-style-type: none"> <li>1. Describe the diffraction through slits and its applications.</li> <li>2. Apply the foundation of laser and fiber optics in development of modern communication technology.</li> <li>3. Relate the basics of electrodynamics which is prerequisite for satellite communications, antenna theory etc.</li> <li>4. Explain the fundamentals of relativity.</li> <li>5. Assimilate the wide scope of nanotechnology in modern developments and its role in emerging innovating applications.</li> </ol>



  
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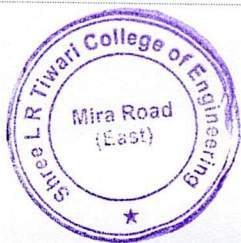
		6. Interpret and explore basic sensing techniques for physical measurements in modern instrumentations.
<b>HUMANITIES &amp; APPLIED SCIENCES</b>		<b>EVEN SEMESTER</b>
<b>Course code</b>	<b>Course Name</b>	<b>Course Outcomes</b>
<b>FEC203</b>	<b>ENGINEERING CHEMISTRY - II</b>	Learners will be able to... 1. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. 2. Illustrate the concept of emission spectroscopy and describe the phenomena of fluorescence and phosphorescence in relation to it. 3. Explain the concept of electrode potential and nernst theory and relate it to electrochemical cells. 4. Identify different types of corrosion and suggest control measures in industries. 5. Illustrate the principles of green chemistry and study environmental impact. 6. Explain the knowledge of determining the quality of fuel and quantify the oxygen required for combustion of fuel
<b>FEC204</b>	<b>ENGINEERING GRAPHICS</b>	Learners will be able to... 1. Apply the basic principles of projections in Projection of Lines and Planes 2. Apply the basic principles of projections in Projection of Solids. 3. Apply the basic principles of sectional views in Section of solids. 4. Apply the basic principles of projections in converting 3D view to 2D drawing. 5. Read a given drawing. 6. Visualize an object from the given two views.
<b>FEC205</b>	<b>C PROGRAMMING</b>	Learner will be able to... . Formulate simple algorithms for arithmetic, logical problems and translate them to programs in C language 2. Implement, test and execute programs comprising of control structures. 3. Decompose a problem into functions and synthesize a complete program. 4. Demonstrate the use of arrays, strings and structures in C language. 5. Understand the concept of pointers
<b>FEC206</b>	<b>PROFESSIONAL COMMUNICATION &amp; ETHICS - I</b>	Learners will be able to understand how to... 1. Eliminate barriers and use verbal/non-verbal cues at social and workplace situations. 2. Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.



  
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		<p>3. Prepare effectively for speaking at social, academic and business situations.</p> <p>4. Use reading strategies for faster comprehension, summarization and evaluation of texts.</p> <p>5. Acquire effective writing skills for drafting academic, business and technical documents.</p> <p>6. Successfully interact in all kinds of settings, displaying refined grooming and social skills</p>
<b>HUMANITIES &amp; APPLIED SCIENCES</b>		<b>EVEN SEMESTER</b>
<b>Course code</b>	<b>Course Name</b>	<b>Course Outcomes</b>
<b>FEL201</b>	<b>ENGINEERING PHYSICS – II</b>	<p>Learners will be able to...</p> <p>1. Perform the experiments based on diffraction through slits using Laser source and analyze the results.</p> <p>2. Perform the experiments using optical fibre to measure numerical aperture of a given fibre</p> <p>3. Perform the experiments on various sensors and analyze the result.</p>
<b>FEL202</b>	<b>ENGINEERING CHEMISTRY - II</b>	<p>Learner will be able to...</p> <p>1. Determine moisture and ash content of coal</p> <p>2. Analyze flue gas</p> <p>3. Determine saponification and acid value of oil</p> <p>4. Determine flash point of a lubricating oil</p> <p>5. Synthesize a drug and a biofuel.</p> <p>6. Determine na/k and emf of cu-zn system</p>
<b>FEL203</b>	<b>ENGINEERING GRAPHICS</b>	<p>Learner will be able to...</p> <p>1. Apply the basic principles of projections in 2D drawings using a CAD software.</p> <p>2. Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.</p> <p>3. Apply the concepts of layers to create drawing.</p> <p>4. Apply basic AutoCAD skills to draw different views of a 3D object.</p> <p>5. Apply basic AutoCAD skills to draw the isometric view from the given two views.</p>
<b>FEL204</b>	<b>C PROGRAMMING</b>	<p>Learner will be able to...</p> <p>1. Translate given algorithms to a program.</p> <p>2. Correct syntax and logical errors.</p> <p>3. Write iterative as well as recursive programs.</p> <p>4. Represent data in arrays, strings and structures and manipulate them through a program.</p> <p>5. Declare pointers and demonstrate call by reference concept.</p>



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HUMANITIES & APPLIED SCIENCES		EVEN SEMESTER
Course code	Course Name	Course Outcomes
FEL205	<b>PROFESSIONAL COMMUNICATION &amp; ETHICS - I</b>	Learner will be able to... 1. Listen and comprehend all types of spoken discourse successfully. 2. Speak fluently and make effective professional presentations. 3. Read large quantities of text in a short time to comprehend, summarise and evaluate content. 4. Draft precise business letters, academic essays and technical guidelines. 5. Dress finely and conduct themselves with panache in social, academic and professional situations.
FEL206	<b>BASIC WORKSHOP PRACTICE – II</b>	Learner will be able to... 1. Develop the necessary skill required to handle/use different carpentry tools. 2. Identify and understand the safe practices to adopt in electrical environment. 3. Demonstrate the wiring practices for the connection of simple electrical load/ equipment. 4. Design, fabricate and assemble pcb. 5. Develop the necessary skill required to handle/use different masons tools. 6. Develop the necessary skill required to use different sheet metal and brazing tools. 7. Able to demonstrate the operation, forging with the help of a simple job.



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