DAYANANDA SAGAR COLLEGE OF ENGINEERING
B.E. in ROBOTICS AND ARTIFICIAL INTELLIGENCE
Scheme of Teaching and Examinations 2022
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2024-25)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD)	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical /Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	22MAT31D	STATISTICS, NUMERICAL METHODS & TRANSFORMS	TD-MAT	3	0	0	03	50	50	100	3
2	PCC	22RI32	Fundamentals of Robotics and Applications	TD: RI	3	0	0	03	50	50	100	3
3	IPCC	22RI33	Digital Electronic Circuits	TD: RI	3	0	2	03	50	50	100	4
4	IPCC	22RI34	DRIVE SYSTEMS FOR ROBOTICS	TD: RI	3	0	2	03	50	50	100	4
5	PCCL	22RIL35	Data Structures and Algorithm Lab	TD: RI	0	0	2	03	50	50	100	1
6	ESC	22RI36X	ESC/ETC/PLC (Elective)	TD: RI	3	0	0	03	50	50	100	3
7	SCR	22SCR37	Social Connect and Responsibility	Any Department	0	0	2	01	100	---	100	1
8	AEC/SEC	22RI38X	Ability Enhancement Course/Skill Enhancement Course - III	TD:RI	If the course is a Theory			01	50	50	100	1
					1	0	0					
					If a course is a laboratory			02				
					0	0	2					
Total					**15**	**0**	**8**		**450**	**350**	**800**	**20**

Course prescribed to lateral entry Diploma holders admitted to III semester B.E./B.Tech programs												
9	NCMC	22MATDIP31	Additional Mathematics - I	Maths	02	02	0	---	100	---	100	0

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering. **ESC**: Engineering Science Course, **ETC**: Emerging Technology Course, **PLC**: Programming Language Course

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Engineering Science Course (ESC/ETC/PLC) (Note: Student should go for the course which should not be similar to the course opted in 1st Year)			
22RI361	Data Structures and Algorithms	22RI363	Graph Theory Algorithms for Robotics
22RI362	Logic Design	22RI364	Optimization Technique
Ability Enhancement Course – III			
22RIL381	MATLAB & SIMULINK	22RIL383	Web Programming
22RIL382	ESSENTIALS OF MS OFFICE FOR ENGINEERS	22RIL384	Linux Programming

***Note: If ability enhancement course is offered as laboratory, keep the subject code as 21XXL38X**

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching–Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Mini Project - I: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students. **The group of the mini project should be framed and guide should be allocated at the first week of the third semester. The final evaluation of the Mini Project – I will be done at the end of fourth semester.**

Non–Credit Mandatory Courses (NCMC):

A. Additional Mathematics I and II:

1) These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E./B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semester/s to earn the qualifying CIE marks. These courses are slated for CIE only and has no SEE.
2) Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.
3) Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory.

Mandatory Course Schedule

<table>
<tr><th colspan="4">Scheduled activities for III to VI semesters</th></tr>
<tr><td>22NS84</td><td>National Service Scheme (NSS)</td><td>NSS</td><td rowspan="4">• National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG) and cultural Activity (CA) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). For the successful completion of the registered course it is necessary for students to provide a participation certificate to fulfil the requirements of this mandatory course for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Cultural activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.
• In case, any student fails to register for NSS, PE, Yoga or CA/fails to submit the requirements, he/she shall be deemed to have not completed the requirements of the course. In such a case, the student has to fulfill the course requirements during subsequent semester.
• Successful completion of the course shall be indicated as satisfactory in the grade card. Non-completion of the course shall be indicated as Unsatisfactory.
• These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.</td></tr>
<tr><td>22PE84</td><td>Physical Education (PE)(Sports and Athletics)</td><td>PE</td></tr>
<tr><td>22YO84</td><td>Yoga</td><td>Yoga</td></tr>
<tr><td>22CA84</td><td>Cultural Activity</td><td>CA</td></tr>
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III SEMESTER- SYLLABUS

Statistics, Numerical methods & Transforms

Sub Code: 22MAT31D	Credits: 03
L: P: T: S: 3: 0: 0: 0	CIE Marks: 50
Exam Hours: 03	SEE Marks: 100
Total hours: 40	

COURSE OBJECTIVES:

1. To use method of least square for finding best fit curves and to analyze Statistical data.
2. To introduce Numerical methods to solve differential Equation
3. To understand the basic concepts in Laplace transform, Inverse Laplace transform to solve differential equation problems
4. Explain the concept of Fourier Series, Integral transform and state the use of it in time varying signals (continuous).

CO1	Understand the Definitions of Curve fitting, Numerical methods, Statistics and Integral equations.
CO2	Explain Least square method, solution of Ordinary differential equation and PDE by Numerical Methods, Laplace Transform, Inverse Laplace Transform as a tool for solving Integral equations and Engineering applications problems
CO3	Periodic functions in Fourier series, Laplace transform, Infinite Fourier Transform as a tool for solving integral equations and Ordinary differential equations and Engineering Application problems
CO4	Apprehend curve fitting techniques in regression, coefficient of correlation, determine half range series, solve differential equation using Transforms and Numerical methods. Implement the principles of Fourier series & Transforms in Signals
CO5	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data, develop the proficiency in solving ordinary differential equations arising in engineering applications, using numerical methods, evaluate the Fourier series expansion for different periodic functions, Determine Half- range Fourier sine and cosine expansions, Evaluate Infinite Fourier transforms and Laplace transform

Course Outcomes: At the end of the course, student will be able to:

Mapping of Course outcomes to Program outcomes:

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

CO3	**3**	**2**	**1**	**1**								
CO4	**3**	**2**	**1**	**1**								
CO5	**3**	**2**	**1**	**1**								

Module	Contents of the Module	Hours	CO's
1	**Curve Fitting & Statistics:** **Curve Fitting**: Curve fitting by the method of least squares -Fitting a straight line, Fitting a second degree Parabola, Fitting a curve of the form - $y = ab^x, y = ae^{bx}, y = ax^b$. **Statistical Modeling:** Analyzing a Bivariate distribution – Scatter diagram, Correlation – Coefficient of Correlation. Regression – Lines of Regression, Regression curves, Properties of Regression Coefficients Angle between lines of Regression- Case Study. Pedagogy: Chalk and talk/PowerPoint Presentation/Videos Web Link: https://nptel.ac.in/courses/111105042 Video Lectures	08	CO1-CO5 **L1 - L4**
2	**NUMERICAL METHODS FOR ODE & PDE:** Numerical solution of Linear First order Ordinary Differential Equations: Taylor's series method, Runge-Kutta method of fourth order. Application Problem **Numerical solution of Partial Differential Equations**: Finite difference approximations to derivatives, Difference Equations, Classification of Partial differential equations of second order- Parabolic Equations- Numerical solution of one-dimensional heat equation - Schmidt method & Crank-Nicholson Method. Hyperbolic equations - Numerical solution of one-dimensional wave equation Pedagogy: Chalk and talk/PowerPoint Presentation/Videos Web Link: https://nptel.ac.in/courses/111105038 Video Lectures	08	CO1-CO5 **L1 - L4**
3	**LAPLACE TRANSFORM & INVERSE LAPLACE TRANSFORM:** **Laplace Transform**: Introduction- Laplace Transforms of Elementary functions- Laplace Transforms of $e^{at}f(t), t^n f(t)$ & $\frac{f(t)}{t}$, Periodic function. **Inverse Laplace Transform** - By the Method of Partial Fractions, Convolution Theorem (statement only)- Problems. Solution to Linear Differential Equations- Application Problems. Web Link: https://archive.nptel.ac.in/courses/111/106/111106111/	08	CO1-CO5 **L1 - L4**
4	**FOURIER SERIES:** Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and with arbitrary period $2l$, Half-range Fourier sine and cosine series, Practical Harmonic Analysis. Application Problems. Pedagogy: Chalk and talk/PowerPoint Presentation/Videos Web Link: https://archive.nptel.ac.in/courses/111/106/111106111/ Video Lectures	08	CO1-CO5 **L1 - L4**

5	**FOURIER TRANSFORM:** Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Inverse Fourier transforms, Inverse Fourier sine and cosine transforms, Convolution theorem (without proof), Parseval's identity- problems. Application Problem Pedagogy: Chalk and talk/PowerPoint Presentation/Videos Web Link: https://archive.nptel.ac.in/courses/111/106/111106111/	08	CO1-CO5 **L1 - L4**
	Self-study component Module 1: Rank Correlation Module 2: Numerical solution of Hyperbolic Equation- Laplace Equation Module 3: Unit Impulse function Module 4: Complex form of Fourier series Module 5: Fourier Integral Theorem	10	CO1-CO5 **L1 - L4**

Text Books:

1. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics**,** Sultan Chand & Sons, ISBN:9789351611738.
2. M. K. Jain, S. R. K. Iyengar & R. K. Jain "Numerical Methods: For Scientific & Engineering Computation", New Age International Publications, 6th Ed, 2012, ISBN: 9788122433234
3. C Ray Wylie, "Advanced Engineering Mathematics", Tata McGraw Hill Education publishers, 1975, ISBN 13: 9780071135436
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2007, ISBN: 9788126531356

Reference Books:

1. Murray Speigel, Schaum's Outline of "Advanced Mathematics for Engineers and Scientists" McGraw-Hill, 1971; ISBN: 9780070602168
2. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8thEdition, 2011, ISBN: 9788131808320.
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2002, ISBN: 8173194203.
4. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2014 ISBN :9788174091956

Fundamentals of Robotics and Applications

Sub Code: 22RI32	Credits: 03
L: P: T: S: 3: 0: 0: 0	CIE Marks: 50
Exam Hours: 03	SEE Marks: 100
Total hours: 40	

COURSE OBJECTIVES:

1. Familiarize with the Anatomy of robot and motion analysis.
2. To interpret the robot control systems, effectors its mechanisms.
3. Study the application of robot technology in wheeled mobile robots, medical robots, unmanned aerial vehicles, service robots, underwater robots

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	To familiarize students with brief history of robots, basic components of robots, understanding the relationship between Automation and Robotics.
CO2	To understand Robot anatomy, Classify and to interpret the robot motion analysis.
CO3	To gain a comprehensive understanding of the Control systems and End effectors.
CO4	To analyze the fundamentals of robot programming its types and sensors.
CO5	To understand the Trajectory path planning, its consideration and diversified applications of robotics.

COURSE CONTENTS:

Unit	Course Contents	Hrs	CO
1	Introduction: Definition of Robotics, Automation and Robotics, Laws of robotics, Brief history of robotics, Basic components of robot, Robot specifications. Types of Robots, Manipulators, Legged Robots, wheeled robots, Aerial Robots, Humanoid robots, Cobots, Safety measures in robotics, social impact, Robotics market and the future prospects, Advantages and disadvantages of robotics.	8	CO1
2	**Robot Anatomy and Motion Analysis:** Anatomy of a Robot, Robot configurations: polar, cylindrical, Cartesian, and jointed arm configurations, SCARA, Robot links and joints, Joint Schemes, Design considerations of links and joints, Degrees of freedom: types of movements, vertical, radial and rotational traverse, roll, pitch and	8	CO2

	yaw, Wok volume/envelope, Robot kinematics: Introduction to direct and inverse kinematics, transformations and rotation matrix, simple numerical on rotation and transformation matrix.		
3	**Robot Drive system And End Effectors:** Introduction to Robot drive systems-Types: Hydraulic, Pneumatic and Electric drive systems. Robot control System, types: Limited sequence control, Point-to-point control, Playback with continuous path control, and intelligent control, difference between open loop, closed loop, Reactive control, deliberative control system. End effectors: Classification of end effectors, mechanical grippers, vacuum grippers, magnetic grippers, adhesive gripper, and gripper force analysis and gripper design and its considerations.	8	CO3
4	**Robot Programming and Sensors:** Introduction to robot programming, Methods of Robot Programming-Lead through, Textual, Lead through programming Methods-Powered and Manual lead through. Generations of Robot Programming Languages, Robot Language structure. Robot sensors classification and its functions, actuators, transducers, Internal state sensors, external state sensors position, velocity sensors, Resolvers, Encoders, Definition of Machine Vision.	8	CO4
5	**Trajectory Planning and Robot Applications:** Introduction to Trajectory planning, path control modes, General considerations of Path planning, Schemes of Path generations, and General considerations of joint interpolated Trajectory, Trajectory planning with 3rd order polynomial. Straight line, circular paths, position and orientation planning. **Applications**: Medical care and Hospitals, Industrial / Assembly Robots, Welding, Flexible Manufacturing Systems, Robots in construction trades, Underground mining, Under water, Defense and Firefighting, Robots in space explorations, Teaching robots, Logistics, Agriculture, House hold, Rehabilitation robots, Swam robots, surveillance robots and entertainment sectors.	8	CO5

TEXT BOOKS:

1) S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education, 2009.
2) "Robotics and Control" R. K. Mittal, I. J. Nagrath Tata-McGraw-Hill Publications, 2007

3) Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, Special Edition, (2012).
4) Ganesh S Hegde, “A textbook on Industrial Robotics”, University science press, 3rdedition, 2017

REFERENCE BOOKS:

1) Advances in Rehabilitation Robotics”, Z. Zenn BienDimitar Stefanov Springer Publications, Year-2004
2) “Army of None: Autonomous Weapons and the Future of War”, Paul Scharre, Publisher: W. W. Norton & Company; 1st edition, Year 2018
3) “Design of Dynamic Legged Robots”, Sangbae Kim, Patrick M. Wensing. Publisher: Now Foundations and Trends, Year 2017.

DIGITAL ELECTRONIC CIRCUITS

Sub Code: 22RI33	**Credits: 04**
L: P: T: S: 3: 2: 0: 0	**CIE Marks: 50**
Exam Hours: 03	**SEE Marks: 100**
Total hours: 50	

COURSE OBJECTIVES:

1. Understand different logic families and illustrate the simplification of algebraic equations using K-Maps and variable entered mapping technique.
2. Define and describe operations of Decoders, Encoders, Multiplexers, Carry look ahead adder and Binary comparators
3. Define and describe Flip-Flops, Counters and Registers
4. Design and analysis of counters
5. Design and develop Mealy and Moore models for digital circuits

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Apply the knowledge of Combinational Logic, TTL logic families and simplify algebraic equations using Karnaugh Maps, Variable entered mapping technique.
CO2	Analyze the operation of Decoders, Encoders, Multiplexers, Carry look ahead adders and Comparators
CO3	Illustrate the operation of Latches, Flip Flops, Counters and Shift Registers
CO4	Design combinational and sequential circuits
CO5	Analyze Mealy and Moore Models for digital circuits and Design Synchronous Sequential Circuits, State diagrams and Programmable Logic Devices

COURSE CONTENTS(Theory):

Unit	Course Contents	Hrs	CO
1	**Introduction to Logic Families:** Introduction**,** Characteristic of Digital ICs, Fan-In, Fan-Out, Propagation delays, Noise Margins, Current sourcing and Current sinking, TTL NAND circuit description and operation. **Principles of combinational logic**: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps– 3 and 4 variables, incompletely specified functions (Don't Care terms), VEM Technique (minterms only).	8	1
2	**Analysis and design of combinational logic**: General approach, Decoders, Encoders, Digital multiplexers, using multiplexers as Boolean function generators. Adders and Subtractors, Cascading full adders, Ripple carry adder, Carry Look Ahead Adder, Binary comparators.	8	2
3	**Sequential Circuits-1:** Basic Bistable element, Latches, SR Latch, Application of SR Latch, A Switch debouncer, The Clocked SR Flip Flop, JK Flip Flop, The Master-Slave JK Flip-flop, Edge Triggered Flip-Flops, Characteristic equation and Timing diagram of Flip-Flop circuits.	8	**3**
4	**Sequential Circuit-2:** Counters - Binary Ripple Counters, Design of Asynchronous Mod-N counters, Synchronous Binary counters, Design of a synchronous Mod-N counter using clocked JK, D, T and SR flip-flops. Registers, Counters based on registers.	8	4
5	**Finite State Machine Design:** Introduction, Mealy and Moore models, State Machine notation, Transition equations, Transition tables, Excitation tables, state tables and state diagrams. Analysis and Design of Synchronous Sequential Circuits with numericals. **Memory and Programmable Logic Devices**: Random Access-Memory, Timing waveforms, Read Only Memory, Programmable logic devices (PROM, Programmable Logic Array, Programmable Array Logic Devices), Implementation of combinational circuits using PLDs.	8	5

COURSE CONTENTS (PRACTICAL)

#	NAME OF THE EXPERIMENT	CO
1	Simplification, realization of Boolean expressions using logic gates/Universal gates.	**1**
2	Realization of Half / Full adder and Half / Full Subtractors using logic gates.	**1**
3	Using 7483 chip (i) Realization of parallel adder / Subtractors (ii) BCD to Excess-3 code conversion and vice versa.	**2**
4	Realization of Binary to Gray code conversion and vice versa.	**2**
5	MUX / DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.	**2**
6	Realization of One / Two bit comparator and study of 7485 magnitude comparator.	**3**
7	Use of a) Decoder chip to drive LED display b) Priority encoder.	**3**
8	Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.	**3**
9	Design and Realization of 3 bit counters as a sequential circuit and MOD– N counter (7476, 7490, 74192, 74193).	**4**
10	Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74LS95	**4**
11	Wiring and testing of Ring counter/Johnson counter	**5**
12	Wiring and testing of Sequence generator	**5**

SELF-STUDY COMPONENTS:

Module 1 :	5 variables Karnaugh maps, VEM Technique for Maxterm expressions.
Module 2 :	Design methods of building blocks of combinational logics.
Module 3 :	Conversion of Flip-Flops.
Module 4 :	Design of Sequence generator.
Module 5 :	Design of Sequence Detector.

TEXT BOOKS:

1.	Donald D Givone, "Digital Principles and Design", *Tata McGraw Hill Edition*, 2002.
2.	R.P. Jain, "Modern Digital Electronics", 4th edition, *Tata McGraw-Hill Education*, 2003.
3.	M Morris Mono, "Digital Logic and computer design", *Prentice Hall*, 2006.

REFERENCE BOOKS:

1.	Charles H Roth, Jr., "Fundamentals of logic design", *Thomson Learning*, 2004.
2.	Mono and Kim, "Logic and computer design Fundamentals", Second Edition, *Pearson*, 2001.
3.	Ronald J Tocci, Neal S. Wildmer, and Gregory L. Moss, "Digital Systems: Principles and Applications", 9th Edition, *Pearson*, 2004.
4.	William I. Fletcher, "An Engineering Approach to Digital Design", *Prentice-Hall*, 1980.

DRIVE SYSTEMS FOR ROBOTICS

Sub Code: 22RI34	Credits: 04
L: P: T: S: 3: 2: 0: 0	CIE Marks: 50
Exam Hours: 03	SEE Marks: 100
Total hours: 50	

COURSE OBJECTIVES:

1) To understand the basic knowledge of different types of Drives systems with respect to robot motion analysis.
2) To understand the selection of hydraulic and Pneumatics components for relevant applications.
3) To make students familiar with the advanced electrical drives.

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	To understand the basic knowledge of different types of Drives systems with respect to robot motion analysis.
CO2	To interpret the Hydraulic drive mechanism, circuits and its considerations.
CO3	To familiarize the Pneumatic drive mechanism, circuit designs and its advantages.
CO4	To understand the importance of electrical drive systems, implementations of electro pneumatic drive.
CO5	To know the Electrical drive characteristics and to familiarize about advanced drives like PLC its applications and supervisory control systems.

COURSE CONTENTS(Theory):

Unit	Course Contents	Hrs	CO
1	**Introduction to Drives:** Drive system, Types of drive Systems, Functions of drive system, Salient features, and applications. Control systems of robot joints, open loop control, closed loop control, Controllers-On-off, Proportional, Integral, Proportional-plus-integral (P-I), Proportional-plus-Derivative(P-D), Proportional-plus-derivative (P-I-D). Power transmission systems- Gears, Power Screws, Chain drives, Rope/Belt drives, Harmonic drives.	8	1
2	**Hydraulic Drives:** Introduction to fluid power systems, Pascal's law and related simple problems, Requirements, Hydraulic pumps-Positive and Non positive displacement pumps- pumping theory, Gear pumps- working of external gear pump. Types of hydraulic actuators, Single acting and double acting linear actuators. Hydraulic Motors-Rotary Actuators-	8	2

	Gear Motors. Direction Control Valves of hydraulic systems, Pressure Control Valve-pressure relief valve, flow control valve-types, Hydraulic Circuit Designs-working of single acting cylinder, double acting cylinders, regenerative cylinders. Advantages, disadvantages and applications of hydraulic drives.		
3	**Pneumatic Drives:** Introduction to Pneumatics system, Choice of working medium, Components of Pneumatic Power Systems, Production of compressed air, Compressor-Rotary vane compressor, Air pressure regulator, Pneumatic Actuators, Classification of Air Cylinders, Construction of Linear Cylinder(Double acting),Rotary actuators-Vane and turbine type air motors, design parameters, Pneumatic Control valves-Classification based on their functions, Direction Control Valves(DCV),Flow control Valves(FCV),Pressure Control Valve, Filter Regulator Lubricator, Design of Pneumatic Circuits-Direct actuation of cylinder, Indirect actuation of cylinder, Principle of Cascade systems, Advantages, disadvantages and applications of pneumatic drives.	8	**3**
4	**Electric Drives:** Introduction to Electric Motors-DC motors, Stepper motors, Servo motors, Brushless DC Motor(BLDC), AC electric motor, Synchronous motor drives, Direct drive actuator, Servo motor characteristics, Power Modulator, Requirements of good servo motors, Solenoid actuators, Switched Reluctance Motors (SRM), Variable Frequency Drive(VFD), Advantages, disadvantages and applications of electric drives.	8	4
5	**Electrical Drive Characteristics:** Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant. **Programmable Logic Controllers:** Programmable Logical Controllers, Components of PLC, ladder logic diagrams, Elements of Logic control, Boolean algebra and truth tables, Personal computers and Programmable Automation Controllers, Simple exercise problems on PLC. Advantages, disadvantages and applications of PLC, Basic concepts of Supervisory Control and Data Acquisition (SCADA), Comparison study of Hydraulics, Pneumatics and Electric drive systems.	8	5

COURSE CONTENTS (PRACTICAL)

#	NAME OF THE EXPERIMENT
1	Experimental study on direct operation of Single acting hydraulic cylinder
2	Experimental study on direct operation of Double acting hydraulic cylinder
3	Exercise on working regenerative Hydraulic cylinder incorporating its components.
4	Exercise on working Single acting Pneumatic cylinder incorporating its components.
5	Exercise on working Double acting Pneumatic cylinder incorporating its components.
6	Simple exercises on Electro pneumatic and Hydraulic actuators.
7	Exercise on Load test of DC Motor
8	Exercise on Position, direction and speed control of stepper Motor
9	Exercise on Position, direction and speed control DC or AC servomotor using Power Electronic Drive
10	Exercise on PLC drives system with simple case studies or applications (Lamp Circuits, Push button switch, control relay, Conveyor controller applications, Lift control applications, Logic gates, alarm systems, PLC integrated to Hydraulic, Pneumatic drives etc.)
11	Demonstration of RS232/USB Cable for downloading ladder programme.
12	Demonstration study of single acting and double acting a shock absorber

Note: Experiments from No. 1 to No.7 can also be executed through Automation Studio software (Famic Technologies Inc.)

TEXT BOOKS:

1) Hydraulics and Pnuematics by Fluid Power controls- Dr. A C Niranjan, New Edition, Pooja Publications.

2) “Hydraulics and Pneumatics”- Fundamentals of Fluid power Engineering by R K Hegde , Niranjan murthy; Third edition, Spana Book House Publications.

3) Industrial Robotics-Technology, Programming and Applications-Mikell P Groover, Mitchell Weiss et al,Tata Mc Graw Hill Publishing Company Limited, New Edition.

4) Automation, Production systems, Computer-Integrated Manufacturing, Fourth Edition, Mikell P Groover.

5) Gobal K. Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosal Publishing House,New Delhi, 2001.

6) D. P. Kothari, and I. J. Nagrath, (2017), Electric Machines, McGraw Hill Education; Fifth edition, (23 June 2017).

REFERENCE BOOKS:

1) Fluid Power system, Basic approach to Hydraulics and Pneumatics, R K Hegde, Fifth Edition, 2018.
2) A Text Book of Hydraulic Machines, by B J RANGANATH SRIKANTAPPA.
3) Pneumatic Systems, Principles and Maintenance- SR Majumdar, New Edition, Tata Mc. Graw Hill Education Private Limited.
4) Ganesh S Hegde, "A textbook on Industrial Robotics", University science press, 3rdedition, 2017.
5) Mechatronics-Electronic control systems in Mechanical and Electrical Engineering, 4 th Edition- W. Bolton- Pearson Publications.
6) Computer Based Industrial Control- Krishna Kant, EEE-PHI,2 nd edition,2010.
7) P. S. Bimbhra, (1977), Electrical Machinery, KHANNA PUBLISHERS, Seventh edition, (1 January 1977).

DATA STRUCTURES AND ALGORITHMS LAB

Sub Code: 22RIL35	**Credits: 01**
L: P: T: S: 1: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 02	**SEE Marks: 50**
Total hours: 15	

COURSE OBJECTIVES:

1. Linear data structures and their applications such as stacks, queues and lists.
2. Non Linear data structures and their application such as trees
3. Sorting and searching algorithms
4. Basic algorithm implementations
5. Implementation of DFS, BFS traversals of a graph and prisms algorithm

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Design and implement various linear data structures and nonlinear data structures like linked list and its different types by applying basic programming concepts
CO2	Implement different types of algorithms and analyse their efficiency

COURSE CONTENTS:

Unit	Experiments
1	Implementation of stack operations
2	Implementation of Linear Queue using Arrays

3	Implementation of Circular Queue using Arrays
4	Implementation of Double Queue using List
5	Implementation of Priority Queue
6	Implementation of Single Linked List and Double Linked List
7	Implementation of Tree Traversal Operations
8	Implementation of construction of AVL Trees
9	Implementation of construction of red black tree in data structure
10	Implementation of quick sort and merge sort algorithms (with calculation of time)
11	Implement Linear search and Binary Search algorithms to search an element in a given array. (with calculation of time)
12	Construction of Binary Search Tree and postfix expression tree

E-Resourses:

1. Data Structures Welcome to Virtual Labs - A MHRD Govt of india Initiative (vlabs.ac.in)

Data Structures and Algorithms

Sub Code: 22RI361	**Credits: 03**
L: P: T: S: 3: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 03	**SEE Marks: 100**
Total hours: 40	

COURSE OBJECTIVES:

1. Explain fundamentals of data structures and their applications essential for programming/problem solving
2. Illustrate linear representation of data structures: Stack, Queues, Lists and Trees
3. Demonstrate sorting and searching algorithms
4. Find suitable data structure during application development/Problem Solving
5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Acquire the fundamental knowledge of various types of data structures and pointers
CO2	Apply the fundamental programming knowledge of data structures to analyze and design linear data structures, namely, stack, queue, singly linked list and doubly linked list and use them for solving problems
CO3	Implement and apply the concept of binary trees and graph data structures and also understand their traversals.

CO4	Analyze non-recursive and recursive algorithms and to represent in terms of standard Asymptotic notations.
CO5	Apply Divide and Conquer, Decrease and Conquer, Dynamic programming, Greedy, and Backtracking algorithm design techniques to solve real time problems

COURSE CONTENTS:

Unit	Course Contents	Hrs	CO
1	**Introduction:** Data Structure, Classification (Primitive and non-primitive), data structure operations. Structure and pointers: Definition and types, initialization and declaration of pointers Array of pointers. **Linear Data Structures –Stacks:** Introduction to Arrays, types, initialization and declaration of arrays and Operations on stacks. Applications of Stack	8	CO1
2	**Linear Data Structures –Queues:** Introduction and Definition, Representation of Queue: Array representation of queues. **Linear Data Structures- Singly Linked lists:** Dynamic Memory allocation functions. Definition and concepts singly linked List: Representation of link list in memory, Operations on singly Linked List. Linked List representation of stack and queues. **Linear Data Structures- Doubly Linked lists:** Doubly Linked List: Representation and Operations.	8	CO2
3	**Nonlinear Data Structures:** Basic Terminologies, Binary Trees: Properties, Representation of Binary Tree: Linear representation, Linked representation, Operations on Binary Tree: Insertion, Simple Deletion, Traversals, Binary search trees. Understanding and representing graphs using adjacency matrix and linked list.	8	CO3
4	**INTRODUCTION TO ALGORITHMS:** Fundamentals of Algorithmic Problem Solving **FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:** Analysis Framework, Asymptotic, Notations and Basic Efficiency Classes, Mathematical Analysis of Non- recursive and Recursive Algorithms.	8	CO4

	Sorting and Searching Algorithms: Selection Sort, Bubble sort, Merge Sort, Quick sort Linear Search and Binary Search.		
5	**DECREASE & CONQUER:** Concept of Decrease and Conquer, Graph traversal algorithms Depth First Search, Breadth First Search. **DYNAMIC PROGRAMMING:** Concept of Dynamic Programming, Computing a Binomial Coefficient. **GREEDY METHOD:** Concept of Greedy technique, Prims algorithm **BACKTRACKING:** Concept of Backtracking technique, N- Queens problem.	8	CO5

TEXT BOOKS:

1) "Data Structures using C", Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein Pears
2) "Introduction to the Design & Analysis of Algorithms", Anany Levitin 2nd Edition, Pearson Education, 2007

REFERENCE BOOKS:

1) "Fundamentals of Data Structures in C", Ellis Horowitz and Sartaj Sahni, Universities Press Second edition, 2014
2) "Introduction to Algorithms", Thomas H. Cormen, Charles E.Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006
3) "Data Structures", Seymour Lipschutz, McGraw Hill Revised 1st edition, 2014.

Logic Design

Sub Code: 22RI362	**Credits: 03**
L: P: T: S: 3: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 03	**SEE Marks: 100**
Total hours: 40	

COURSE OBJECTIVES:

1. Be able to design and analyze sequential logic circuits. Understand the basic software tools for the design and implementation of digital circuits and systems.

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Evaluate Boolean Expression using digital principles and knowledge of logic gates
CO2	Outline and analyze combinational logic circuits
CO3	Depict sequential logic circuits using flip flops.
CO4	Investigate different sequential circuits using registers and counters
CO5	Integrate and use the knowledge of state transition diagram for analysis of sequential circuits

COURSE CONTENTS:

Unit	Course Contents	Hrs	CO
1	SIMPLICATION OF BOOLEAN EXPRESSIONS: Positive and Negative logic, Sum-of-Products Method, Truth Table to Karnaugh Map-up to 5 variables, Pairs Quads, and Octets, Karnaugh Simplifications, Don‟t-care Conditions, Productof-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method-up to 4 variables, MEV method –up to 4 variables.	8	CO1
2	DATA PROCESSING CIRCUITS: Multiplexers, Demultiplexers, Decoders, Encoders,Parity generators and checkers, Magnitude Comparators, Code converters : BCD to Excess-3, Binary to Gray code .Adders -Subtracter: Full adder and Subtracter. Problems solving using combinational circuits.	8	CO2
3	SEQUENTIAL DESIGNS: SR-Latch using NAND and NOR gates, Gated Flip- flops, Edge triggered SR, D, J&K Master slave, T flip flops, Timing diagram of edge triggered flip flops, Switch contact bounce circuits, Various representation of Flip-flops, Analysis of sequential circuits. Conversion of flip-flops.	8	CO3
4	SHIFT REGISTERS AND COUNTERS: Types of registers, SISO, SIPO, PISO, PIPO registers, Universal shift register, Applications of shift registers. Counters:3 and 4 bit Asynchronous counters using J & K flip-flops with timing diagrams, Arbitrary asynchronous counter designs using PRESET and CLEAR. Mod-N synchronous counter design using any flip -flops	8	CO4
5	APPLICATIONS OF LOGIC DESIGN: Design of synchronous sequential circuits: Model selection, state transition diagram, State	8	CO5

	synthesis table, Design equations and circuit diagrams, Algorithm State machine, State Reduction Technique.		

TEXT BOOKS:

1. Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 7th Edition, Tata McGraw Hill, 2010.
2. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.

REFERENCE BOOKS:

1. A.P.Godse, D.A.Godse: Logic Design, Technical Publications,2011
2. M Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson Education, 2008.
3. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Cengage Learning, 2004.

Graph Theory Algorithms for Robotics

Sub Code: 22RI363	**Credits: 03**
L: P: T: S: 3: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 03	**SEE Marks: 100**
Total hours: 40	

COURSE OBJECTIVES:

1. To impart the basic knowledge of graph theory.
2. To familiarize the concepts of various types of graphs and simple properties.
3. To familiarize with basic results in graph algorithms and apply to networks for robotics.

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Apply the concepts of graph theory, shortest path and spanning tree algorithms for real-time problems
CO2	Apply the graph connectivity algorithms for flow problems in robotic networks
CO3	Apply the graph spaces and methods in obstacle avoidance
CO4	Apply the graph theory algorithms for robot motion and path planning.

COURSE CONTENTS:

Unit	Course Contents	Hrs	CO
1	Fundamental concepts of graphs. Basic definitions of graphs and multigraphs; adjacency matrices, isomorphism, girth, decompositions, independent sets and cliques, graph complements, vertex coloring, chromatic number, important graph like cubes and the Petersen graph. Paths, cycles, and trails; Eulerian circuits. Vertex degrees and counting; large bipartite subgraphs, the handshake	8	CO1

	lemma, Havel-Hakimi Theorem. Directed graphs: weak connectivity, connectivity, strong components e. Induction and other fundamental proof techniques		
2	Trees. Basics: equivalent characterizations of trees, forests. Spanning trees and 2-switches. Distance and center. Optimization: Kruskal's Theorem and Dijkstra's Theorem	8	CO2
3	Matching and covering. Bipartite matching, vertex cover, edge cover, independent set, M-alternating path, Hall's Theorem, König-Egeváry Theorem, Gallai's Theorem Connectivity. Vertex cuts, separating sets, bonds; vertex and edge connectivity, block-cutpoint tree. Menger's Theorem: undirected vertex and edge versions	8	CO3
4	Network flow. Ford-Fulkerson Labeling algorithm, flow integrality, Max-flow/Min-cut Theorem, proof of Menger's Theorem. Coloring . Chromatic number: lower bounds from clique number and maximum independent set, upper bounds from greedy coloring (& Welsh-Powell), Szekeres-Wilf, and Brooks' Theorem. Also k-critical graphs, cartesian product of graphs, and interval graphs. k-Chromatic graphs: Mycielski's construction, Turán's Theorem. Edge coloring, line graphs, Vizing's Theorem	8	CO4
5	Planarity. Embeddings, dual graphs, Euler's formula. Kuratowski's Theorem. Coloring, including the 5-color theorem. Graph theory applications in robotics motion and path planning, collision and obstacle avoidance.	8	CO4

TEXT BOOKS:

1. Stanisław Zawiślak, Jacek Rysiński, Graph-Based Modelling in Engineering: 42 (Mechanisms and Machine Science), Springer, 2018.
2. Narsingh Deo, Graph Theory with Applications, PHI, 2008

REFERENCE BOOKS:

1. L.R.Foulds , "Graph Theory Applications", Springer ,2016
2. Kevin M. Lynch,Frank C. Park, "Modern Robotics: Mechanics, Planning, and Control", Cambridge University Press, 2017

Optimization TECHNIQUE

Sub Code: 22RI364	**Credits: 03**
L: P: T: S: 3: 0: 0: 0	**CIE Marks: 50**

Exam Hours: 03	SEE Marks: 100
Total hours: 40	

COURSE OBJECTIVES:

1. Appreciate the importance of linear algebra in computer science and allied engineering science.
2. Gain the knowledge of linear algebra tools and concepts to implememt them in their core domain.
3. Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Apply the concepts of vector calculus to solve the given problem
CO2	Apply the concepts of partial differentiation in machine learning and deep neural networks
CO3	Analyze the convex optimization algorithms and their importance in computer science & engineering
CO4	Apply the optimization algorithms to solve the problem.
CO5	Analyze the advanced optimization algorithms for machine learning .

COURSE CONTENTS:

Unit	Course Contents	Hrs	CO
1	Functions of several variables, Differentiation and partial differentials, gradients of vector-valued functions, gradients of matrices, useful identities for computing gradients, linearization and multivariate Taylor series.	8	CO1
2	Backpropagation and automatic differentiation, gradients in a deep network, The Gradient of Quadratic Cost, Descending the Gradient of Cost, The Gradient of Mean Squared Error	8	CO2
3	Local and global optima, convex sets and functions separating hyperplanes, application of Hessian matrix in optimization, Optimization using gradient descent, Sequential search 3- point search and Fibonacci search	8	CO3
4	Unconstrained optimization -Method of steepest ascent/descent, NR method, Gradient descent, Mini batch gradient descent, Stochastic gradient descent.	8	CO4

5	Momentum-based gradient descent methods: Adagrad, RMSprop and Adam. Non-Convex Optimization: Convergence to Critical Points, Saddle-Point methods.	8	CO4

TEXT BOOKS:

1. Mathematics for Machine learning, Marc Peter Deisennroth, A. Aldo Faisal, Cheng Soon Ong, 2020, Cambridge University Press.
2. S. Bubeck, Convex Optimization: Algorithms and Complexity, Foundations and Trends in Optimization, 2015.
3. S. Boyd, N. Parikh, and E. Chu," Distributed optimization and statistical learning via the alternating direction method of multipliers", Foundations and Trends in Machine Learning, Now Publishers Inc.

REFERENCE BOOKS:

1. Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer, 2020
2. A. Beck, First-Order Methods in Optimization, MOS-SIAM Series on Optimization, 2017

SOCIAL CONNECT AND RESPONSIBILITY

Sub Code: 22SCR37	**Credits: 01**
L: P: T: J: 0: 2: 0: 0	**CIE Marks: 100**
Total hours: 15	

COURSE OBJECTIVES:

COURSE OBJECTIVES:

1. Enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government and
2. Build solutions to alleviate the complex social problems through immersion, design & technology.
3. Provide a formal platform for students to communicate and connect with their surroundings.
4. Enable to create of a responsible connection with society.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Understand social responsibility
CO2	Practice sustainability and creativity
CO3	Showcase planning and organizational skills

Module	Contents of the Module	Hours
1	**Plantation and adoption of a tree:** Plantation of a tree that will be adopted for four years by a group of Students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature. **Field visits, Case studies and practice sessions**	03
2	**Heritage walk and crafts corner:** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms. **Field visits, Case studies and practice sessions**	03
3	**Organic farming and waste management:** usefulness of organic farming, wet waste managementin neighboring villages, and implementation in the campus. **Field visits, Case studies and practice sessions**	03
4	**Water Conservation:** Knowing the present practices in surrounding villages and implementation in the campus, documentary or photo blogs presenting the current practices. **Field visits, Case studies and practice sessions**	03
5	**Food Walk** City's culinary practices, food lore, and indigenous materials of the region used in Cooking. **Field visits, Case studies and practice sessions**	03

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (100 Marks)

Sl.No.	Criteria of evaluation	Marks
1	Planning and scheduling the social connect	15
2	Information/Data collected during social connect	15
3	Analysis of Data and report writing	20
	TOTAL	50

Two CIEs of 50 marks each – Presentation/Performance/Viva

Teams of 3 – 5 students will be performing a Jamming session involving presentation/ play/ Open mic/ debate/group discussion on any of the activities of topics in the syllabus followed by Viva Voce for evaluation by two examiners.
GENERAL GUIDELINES:

- Course coordinators assigned for each class will drive this one credit course Social connect and responsibility (22SCR37).

- Faculty will form teams of 3-5 students and are assigned a task/activity drawn from syllabus.
- One hour per week is dedicated to engage students for this course and to be reflected in the time table.
- Every week in that designated period, the student teams and faculty will discuss and decide the action plan for preparation and implementation of the activity. Guest lectures and field visits to be planned for some units of the syllabus content. The minutes of the meetings are recorded in a note book.
- First CIE to be held between first and second tests and second CIE between second and third tests schedules. Faculty will decide the mode of CIE evaluation through presentation/performance by the teams, followed by Q& A/ Viva-Voce.

EACH STUDENT WILL INDIVIDUALLY SUBMIT A REPORT OF THEIR ACTIVITY/TASK PERFORMED/PRESENTED TO THEIR FACULTY FOR EVALUATION AND AWARD OF 100 MARKS FOR CIE; THE RESPECTIVE FACULTY WILL COLLECT ALL REPORTS DULY SIGNED BOTH BY FACULTY & HOD AND STORE THEM FOR ANY INSPECTIONS.

MATLAB & SIMULINK

Sub Code: 22RIL381	**Credits: 01**
L: P: T: J: 0: 2: 0 : 0	**CIE Marks: 50**
Exam Hours: 3	**SEE Marks: 50**
Total hours: 30	

COURSE OBJECTIVES:

1) The course will enable the students to learn how to programme with MATLAB
2) The course will enable the students to learn graphical programming using Simulink

COURSE OUTCOMES:

After completion of the course, the graduates will be able to:

CO	content	Bloom's Level
CO1	Identify the main features of the MATLAB and need for simulation/implementation for the verification of mathematical functions.	L2
CO2	Interpret and visualize simple mathematical functions and operations there on using plots/display.	L2
CO3	Analyse the program for correctness and determine/estimate/predict the output and verify it under a simulation environment using MATLAB.	L3
CO4	Analyse Data and find solutions for engineering problems using MATLAB	L3
CO5	Apply basic modeling techniques and tools to develop Simulink block diagrams	L3

COURSE CONTENTS

UNIT	Course Contents	Hrs	COs
1	Working with MATLAB UI, basic commands and functions, creating variables and using the help menu. Working with Matrices, Arrays and Vectors Entering Matrix, Subscripts, Colon Operator, Basic Matrix Functions.	4	CO1
2	Relational and Logical Operations, Expressions: Variable, Numbers, Operators, Functions. Creating a Plot, Specifying Line Styles and Colors, Adding Plots to an Existing Graph, Multiple Plots in One Figure, Setting Axis Limits, Axis Labels and Titles.	4	CO2
3	Input / Output of Variables, (Numbers and Strings), Characters and Text, Some String Function, Input of Variable, Output of Variable. M-File: Script Files Function Files.	6	CO3
4	Flow Control, *if* statement, *switch* and *case* statement, *for* statement, *while* statement, *break* statement. Exploratory Data Analysis to analyze the data and discover trends.	4	CO4
5	Basics of Simulink: Simulink Graphical Environment, Inspecting Signals, Basic algorithms, Project - Automotive Performance Modes, Simulink and MATLAB, Dynamic Systems in Simulink, Discrete Systems, Continuous Systems, Simulation Time, Project - Modeling a Thermostat, Project - Peregrine Falcon Dive.	4	CO5
6	Application Problems Using MATLAB and SIMULINK	8	CO4, CO5

TEXTBOOKS:

1) MATLAB An Introduction with Applications, Rao V. Dukkipati, New Age international Publishers, 2010.
2) Programming in MATLAB: A problem-solving approach, Ram N Patel, Ankush Mittal, Pearson, 2014

REFERENCE BOOKS:

1) LAB MANUAL For Matlab & SIMULINK, DSCE

ESSENTIALS OF MS OFFICE FOR ENGINEERS

Sub Code: 22RIL382	Credits: 01

L: T: P: S: 0: 0: 2: 0	**CIE Marks: 50**
Exam Hours: 2	**SEE Marks: 50**
Total hours: 30	

COURSE OBJECTIVES:

1) Create Structured Spreadsheet Designs
2) Get exposure to use engineering plots and graphs
3) Introduce User Forms and User Controls for overall Project Control
4) Gain knowledge in Excel and Visual Basic for Applications (VBA)
5) Expand the role of spreadsheets to improve processes
6) Transform Excel into an engineering tool that will help solve real world problems in various industries

COURSE OUTCOMES:

After completion of the course, the graduates will be able to:

CO	content	Bloom's Level
CO 1	Create, format, and analyse the large data to solve engineering problems.	L3
CO 2	Import and export the large data and to get the plots to study the engineering problem	L4
CO 3	Apply the formula, Spreadsheet Logic Capabilities and matrix to solve the system equations.	L3
CO 4	Apply the functions and logical relations to solve the complex engineering problems	L3
CO 5	Develop VBA Functions and Sub Procedures to solve problems	L4
CO 6	Analyse the large data of machines or processes to find the problem and suggest the suitable solutions.	L4

COURSE CONTENTS

UNIT	Course Contents	Hrs	COs
1	**Introduction:** MS office versions, Office 365, using one drive, web version of office tools. **MS-Word:**, Working with Files, Header and footers, Protect the Document, Mail Merge, Styles, Merging the documents, Comments and Track changes, restrict editing, Table of contents, Figures and bibliography, Equation editor, water mark, page borders, Setting	**6**	**1**

	defaults, page columns, adding citations and cross references, sharing the document, file collaboration.		
2	**MS Excel-1:** Creating Worksheet, Copying and Pasting, Auto Fill Data, Selection Techniques for Large Data Range, Inserting Cells, find data with Filter and Sort, retrieve and change data, Conditional Formatting, protecting worksheet, formatting the worksheet, Excel Shortcuts	**6**	**2**
3	**EXCEL DATA AND ANALYSIS:** Manual Text Import and Export, External Data Sources, Data tables, Auto Filter, Range Structure, Range Count, Match Function, Index and Match, Analysing Data, Charting, Create an XY scatter graph, XY chart with two Y-Axes, add error bars to your plot, create a combination chart.	**6**	**3, 6**
4	**MS-POWER POINT:** Create a Presentation from a template- Working with Slides, applying a design template, changing slide layouts, Video and Audio effects, Transition and animations, Screen recording, color Schemes & Backgrounds Adding clip art, adding an image from a file, creating slides using web office, using web version, collaboration and sharing.	**6**	**4**
5	**MICROSOFT OUTLOOK:** Creating account, web version, mobile application, Different Views, adding multiple accounts, tasks, Using Calendar, create Meetings, contacts and group contacts, Sending group mails, mail follow ups, managing spam mails, Auto reply, Handling signatures, setting defaults.	**6**	**5**

TEXTBOOKS:

1) Byron Gottfried, Spreadsheet Tools for Engineers Using Excel ® 2007, 1st Edition, ISBN-13: 978-0073385860, McGraw Hill, January 22, 2009.
2) Clare Martin, Helen Holding, Mastering Microsoft Office (Palgrave Master), ISBN: 0333949773,9780333949771,9780230802339

REFERENCE BOOKS:

1) Daniel W. Barowy, Spreadsheet Tools for Data Analysts, Publisher - University of Massachusetts Libraries, 2017
2) Paul Bailey Mastering Office Practice, Macmillan Master Series, Publisher: Macmillan Education UK

Web Programming

Sub Code: 22RIL383	**Credits: 01**
L: P: T: S: 1: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 02	**SEE Marks: 50**
Total hours: 15	

COURSE OBJECTIVES:

1. To demonstrate the role of languages like HTML, DHTML, CSS, XML, JavaScript, ASP And protocols in the workings of the web and web applications

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1	Create a HTML page, which has properly aligned paragraphs with image along with it.
CO2	Write a program to display list of items in different styles
CO3	Create both client side and server side image maps
CO4	Create your own style sheets and use them in your web page

COURSE CONTENTS:

Unit	Experiments
1	Create a web page with the following using HTML a. To embed a map in a web page b. To fix the hot spots in that map c. Show all the related information when the hot spots are clicked
2	Create a web page with the following. a. Cascading style sheets. b. Embedded style sheets. c. Inline style sheets. Use our college information for the web pages.
3	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4	Write programs in Java using Servlets: i. To invoke servlets from HTML forms ii. Session tracking using hidden form fields and Session tracking for a hit count
5	Write programs in Java to create three-tier applications using servlets for conducting

	online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6	Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart
7	Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database
8	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
9	i. Validate the form using PHP regular expression. ii. PHP stores a form data into database.
10	Write a web service for finding what people think by asking 500 people's opinion for any consumer product

TEXT BOOKS:

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3" 1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf).
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Download pdf files from the above links).
3. Al Sweigart, "Automate the Boring Stuff with Python",1stEdition, No Starch Press, 2015. (Available under CC-BYNC-SA license at https://automatetheboringstuff.com/)

LINUX PROGRAMMING

Sub Code: 22RI384	**Credits: 01**
L: P: T: J: 1: 0: 0: 0	**CIE Marks: 50**
Exam Hours: 2 Hrs	**SEE Marks: 50**
Total hours: 15	

COURSE OBJECTIVES:

1) To write shell script programs to solve problems.
2) To implement some standard Linux utilities such as ls.cp etc using system calls
3) To develop network based applications.

COURSE OUTCOMES:

After completion of the course, the graduates will be able to:

CO	content	Bloom's Level
CO1	To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.	3
CO2	To evaluate the concept of shell scripting programs by using an AWK and SED commands	4
CO3	To create the directory, how to change and remove the directory	6

COURSE CONTENTS

UNIT	Course Contents	Hrs	COs
1	1)Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: 2)Write a shell script that delete all lines containing a specified word	3	1
2	3)Write a shell script that displays a list of all the files in the current directory 4) Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. whenever the argument is a file or directory.	3	2
3	5)Write a shell script that accept a list of file names as arguments count and report the occurrence of each word. 6)write a shell script to find the factorial of given integer 7)write a shell script that list the all files in a directory.	3	1
4	8) Write a awk script to find the number of characters, words and lines in a file? linked list respectively. 9) Write a C Program that makes a copy of a file using standard I/O and system calls? 10) Implement in C the following Unix commands using system calls A) cat B)mv	3	2
5	11. Write a C program to emulate the Unix ls-l command? 12.Write a C program to list for every file in a directory, its inode number and file name.? 13. Write a C Program that demonstrates redirection of standard output to a file .EX:ls>f1.?	3	3