



Shri Shamrao Patil (Yadavkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
(An Autonomous Institute)
Yadav (Ichalkaranji)-416121, Dist. – Kolhapur

Teaching and Evaluation Scheme for S Y B. Tech.

Department of Automation and Robotics

Semester: III





Shri Shamrao Patil (Yadavkar) Educational & Charitable Trust's

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Yadav (Ichalkaranji)-416121, Dist. – Kolhapur

Department: Automation & Robotics

Rev: Course Structure/01/NEP/2023-24

Class: S.Y. B.Tech

Semester: III

Course Code	Type of Course	Name of the course	Teaching Scheme			Evaluation scheme					Credit
			L	T	P	CAI	CAII	MSE	ESE	Total	
23AR2301	PCC	Sensors in Automation and Robotics	3	0	0	10	10	30	50	100	3
23AR2302	PCC	Microcontrollers & Microprocessors	3	0	0	10	10	30	50	100	3
23AR2303	PCC	Fluid and Thermal Engineering	3	0	0	10	10	30	50	100	3
23AR2304	PCC	Sensors and Instrumentation Laboratory	0	0	2	15	15	-	20	50	1
23AR2305	PCC	Microcontrollers & Microprocessors Laboratory	0	0	2	15	15	-	20	50	1
23AR2306	PCC	Object Oriented Programming Using C++ Laboratory	0	0	2	15	15	-	20	50	1
23AR2307	CEP	Mini Project-II	0	0	2	25	25	-	-	50	1
23AR2308	HSSM	Account and Finance Management	1	0	0	25	25	-	-	50	1
23MILEXX	AEC	Modern Indian Language	2	0	0	25	25	-	-	50	2
23ARMDXX	MDM	Multidisciplinary Minor-I	2	0	0	10	10	30	50	100	2
23OEAR21	OE	Open Elective-I*	2	0	0	10	10	30	50	100	2
23HSSM01	VEC	Aptitude Skills-I	1	0	0	25	25	-	-	50	1
23HSSM02	VEC	Language Skills-I	0	0	2	25	25	-	-	50	1
Total			17	0	10	220	220	150	310	900	22

Basket of Multidisciplinary Minor-I

Sem.	Basket 1 (A-Defense)	Basket 2 (B-Software)	Basket 3 (C-Space)
Sem. III	High Energy Materials Technology (23ARMDA1)	Computer Architecture and Organization (23ARMDB1)	Aerospace Engineering Fundamentals (23ARMDC1)

*Indicates Open Elective course will be offered to students of other programs and will not be offered to students of the same program




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Sensors in Automation and Robotics

23AR2301	PCC	Sensors in Automation and Robotics	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Fundamentals of Automation and Robotics, Basic Electronics Engineering

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

CO1	Select different types of transducers and sensors for given application.
CO2	Select Motion, Proximity And Ranging Sensors
CO3	Select Force, Magnetic and Heading Sensors
CO4	Identify the Optical, Pressure and Temperature Sensors
CO5	Select proper sensors for robot as per application requirement
CO6	Select appropriate drive for Robotic applications.

Course Contents:

<p>Unit 1: Introduction Introduction to measurement, Static & Dynamic Characteristics of measurement, Instrumentation systems architecture, Definition-Sensors, Transducers, Classification of transducers -Resistive, Capacitive and inductive, Specifications of sensors/Transducers, Sensor networks architecture.</p>	[6]
<p>Unit2: Motion, Proximity And Ranging Sensors Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Laser Range Sensor (LIDAR).</p>	[6]
<p>Unit3: Force, Magnetic and Heading Sensors Strain Gauge, Load Cell, Magnetic Sensors –types, principle, requirement and Advantages. Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.</p>	[6]
<p>Unit4: Optical, Pressure And Temperature Sensors Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC,</p>	[6]




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Thermistors, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensor	
Unit 5: Robot Sensors Transducers and sensors, Sensors in robotics, Principles and applications of the following types of sensors- Proximity Sensors, Photo Electric Sensors, Position sensors – Piezo Electric Sensor, LVDT, Resolvers, Encoders – Absolute and Incremental: - Optical, Magnetic, Capacitive, pneumatic Position Sensors, Range Sensors- Range Finders, Laser Range Meters, Touch Sensors, Force and torque sensors, Safety Sensor: Light Curtain, Laser Area Scanner, Safety Switches, Machine vision	[6]
Unit 6: Robot Drive Systems Pneumatic Drives, Hydraulic Drives, Mechanical Drives, Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors, BLDC-Salient Features, Applications and Comparison of all these Drives, Micro actuators, selection of drive, Power transmission systems for robot, Motion conversion, Determination of HP of motor, Types of Gearbox: - Planetary, Harmonic, Cycloidal gearbox and gear Ratio, variable speed arrangements	[6]
Text Books: <ol style="list-style-type: none">1. Ernest O Doebelin, —Measurement Systems – Applications and Designl, Tata McGraw-Hill, 20092. Sawney A K and Puneet Sawney, —A Course in Mechanical Measurements and Instrumentation and Controll, 12th edition, Dhanpat Rai & Co, New Delhi, 2013.3. Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta, Industrial Robotics, Technology, Programming & Applications, Tata McGraw Hill Education Pvt. Ltd. New Delhi4. S. R. Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.5. Groover M.P.-Automation, production systems and computer integrated manufacturingPrentice Hall of India	
Reference Books: <ol style="list-style-type: none">1. C. Sujatha , Dyer, S.A., Survey of Instrumentation and Measurement, John Wiley & Sons, Canada, 20012. Hans Kurt Tönshoff (Editor), Ichiro , —Sensors in Manufacturingl Volume 1, WileyVCH April 2001.3. John Turner and Martyn Hill, —Instrumentation for Engineers and Scientistsl, Oxford Science Publications, 1999.4. Patranabis D, —Sensors and Transducersl, 2nd Edition, PHI, New Delhi, 2011.5. Richard Zurawski, —Industrial Communication Technology Handbookl 2nd edition, CRC Press, 2015.	




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Microcontrollers & Microprocessors

23AR2302	PCC	Microcontrollers & Microprocessors	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics Engineering

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

CO1	Explain architecture and addressing modes of 8085.
CO2	Explain instructions set for assembly language programs using 8085.
CO3	Explain architecture and addressing modes of 8051.
CO4	Make use of 8051 for interfacing External Peripherals.
CO5	Illustrate the application of 8051 microcontroller on chip peripherals to implement the functions of I/O port, timer/Counter, serial port & interrupts
CO6	Design 8051 Microcontroller based systems for measuring electrical and physical quantities

Course Contents:

Unit 1: 8085 Microprocessor Basics of 8085 microprocessor architecture and its functional block, 8085 microprocessor IC pin outs and signals, addressing modes of 8085.	[6]
Unit2: Instruction Set and programming with 8085 Assembly Language programming basics, Instruction set of microprocessor: Data transfer, Arithmetic, logical, loop, branching etc, timing diagram, writing, assembling and executing assembly language programs.	[6]
Unit3:8051 Microcontroller Functional block diagram and pin diagram of 8051, Power supply, clock and reset circuit, Program Counter and ROM space in 8051, Program and Data Memory organization, addressing modes. Instruction Set of 8051: data transfer, arithmetic and logical, program branching instructions, single bit manipulation, shift and Boolean variable manipulation, Interrupt of 8051.	[6]




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Unit4: On-Chip Peripherals And Programming Embedded Programming: Data Types, Operators Embedded Programming: Data Conversion, I/O Programming Timer/Counter: Operating Modes, Programming. UART: Operating Modes, Programming.	[6]
Unit 5: Off-Chip Peripheral Interfacing And Programming Interfacing with 8051: LED, LED pattern display, traffic light display, Switches and Matrix ,Keyboard, LCD, ADC 0808 with Analog Sensor, DAC and their applications.	[6]
Unit 6: Design of Microcontroller Based System Voltage, Current and Frequency Measurement - DC Motor Control - Stepper Motor control - Case Studies: Arduino Board Overview - Arduino IDE - Temperature Control.	[6]
Text Books: <ol style="list-style-type: none">1. Krishna Kant, —Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 80961, PHI, 2014.2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems Using Assembly and C ", 2nd Edition, Pearson Education 2013.3. Kenneth J. Ayala, "The 8051 Microcontroller. Architecture, Programming and Applications", 3rd Edition, West publishing company 2014	
Reference Books: <ol style="list-style-type: none">1. I.Soumitra Kumar Mandal "Microprocessors and Microcontrollers Architecture Programming and Interfacing using 8085, 8086 & 8051" Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2011.2. Myke Predko, "Programming and Customizing the 8051 Microcontroller", 1st Edition, 2012.3. Chris Braith, "8051 Microcontroller Application based Introduction", Elsevier 2004.4. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems "Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2014.	



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Fluid and Thermal Engineering

23AR2303	PCC	Fluid and Thermal Engineering	3-0-0	3 Credits
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Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Fundamentals of Mechanical Engineering

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

CO1	Compare various fluid properties in engineering applications
CO2	Apply Bernoulli's equation to fluid flow problems
CO3	Interpret issues related to fluid flow losses in hydraulic circuits
CO4	Explain working air compressors and Use of compressed air in pneumatic circuits
CO5	Analyze importance of dimensional analysis for model and prototype testing
CO6	Make use of sources of heat and remedies of heat removal in electronic circuits

Course Contents:

<p>Unit 1 Properties of Fluids Characteristics of fluids, Mass density, Specific density, specific gravity, Dynamic viscosity, Kinematic viscosity, Surface tension, capillarity, compressibility, Vapour pressure. Fluid Statics: Pascal's law, Pressure at a point, Total pressure, Centre of pressure, Pressure on a plane, Inclined and curved surfaces, Buoyancy, Metacenter and Meta-centric height, stability of submerged and floating bodies</p>	[6]
<p>Unit 2 Introduction of Fluid Kinematics Types of flows, continuity equation (Cartesian coordinate), velocity and acceleration, visualization of flow field (stream, path and streak Line); Stream function and velocity potential function. (Simple numerical). Fluid Dynamics Euler's equation of motion along a stream line, Derivation of Bernoulli's equation, Applications of Bernoulli's equation, Venturimeter, Orifice meter, Notches, pitot tube (No derivation and numerical for notches and pitot tube).</p>	[6]
<p>Unit 3 Flow through Pipes and Internal flow Flow through Pipes: Darcy-Weisbach equation, major and minor losses, Pipes in series Pipes in parallel and concept of Equivalent Pipe, Siphons, Transmission of Power (no derivations for minor losses).</p>	[6]



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Internal flow: Laminar and Turbulent flow physics, Velocity and shear stress distribution for laminar flow in a pipe, fixed parallel plates (simple numerical on velocity, pressure gradient and shear stress).	
Unit 4 Dimensional Analysis and Lift & Drag Dimensional Analysis and modeling: Significance, Buckingham's Pi Theorem, Similitude, types of similitude. Model and prototype testing Lift and Drag: Friction and pressure drag. Drag and lift coefficients of common geometries.	[6]
Unit 5 Air Compressor Uses of compressed air, classification of compressors, Reciprocating compressor constructional details of single and multistage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, need of multi-staging, intercooling and after-cooling. Rotary Air Compressor: Basic principles, classification, construction, working of roots, vane, scroll, Centrifugal and axial compressors. (Descriptive treatment only).	[6]
Unit 6 Heat Transfer Introduction and Basic Concepts: Application areas of heat transfer, Modes and Laws of heat transfer, Three dimensional heat conduction equation in Cartesian coordinates and its simplified equations, thermal conductivity, Thermal diffusivity, Thermal contact Resistance Thermal Insulation: Types and selection, Economic and cost considerations, Payback period Introduction to heat pipe, Introduction to electronic cooling - Discussion on active and passive methods.	[6]
Text Books: <ol style="list-style-type: none">1. Sukumar Pati, "Fluid Mechanics and Hydraulics Machines", TATA McGraw Hill.2. Munson, Young and Okiishi, "Fundamentals of Fluid Mechanics", Wiley India3. Modi P. N. and Seth S. M, "Hydraulics and Fluid Mechanics", Standard Book House.4. P.K. Nag, Heat & Mass Transfer, McGraw Hill Education Private Limited.5. M.M. Rathod, Engineering Heat and Mass Transfer, Third Edition, Laxmi Publications.6. V. M. Domkundwar, Heat Transfer, Dhanpat Rai & Co Ltd.	
Reference Books: <ol style="list-style-type: none">1. Kundu, Cohen, Dowling, "Fluid Mechanics", Elsevier India2. Potter Wiggert, "Fluid Mechanics", Cengage Learning3. Fox, Pichard, "Introduction to Fluid Mechanics", McDonald- Wiley4. Bela G. Liptak, Instrument Engineers' Handbook – Process Control and Optimization, Volume I & II, Taylor & Francis5. Franck P. Incropera, David P. DeWitt – Fundamentals of Heat and Mass Transfer,6. Y. A. Cengel and A.J. Ghajar, Heat and Mass Transfer – Fundamentals and Applications, Tata McGraw Hill Education Private Limited.7. S.P. Sukhatme, A Textbook on Heat Transfer, Universities Press.	




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Sensors and Instrumentation Laboratory

23AR2304	PCC	Sensors and Instrumentation Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week	CA-I:15 Marks CA-II :15 Marks Practical and Oral Exam: 20 Marks

Pre-Requisites: Fundamentals of Automation and Robotics, Basic Electronics Engineering

Course Outcomes: At the end of the course students will be able to -

CO1	Distinguish contact & Non contact type Instruments
CO2	Select appropriate sensor for given application.
CO3	Illustrate various smart sensors with their applications.

List of Experiments:

At least minimum Eight experiments should be performed from the following list.

1. Identify contact & Non contact type Instruments.
2. Experiment with LVDT for Displacement.
3. Make use of temperature sensors.
4. Study of Hall Effect Sensor
5. Measure strain using strain gauge.
6. Measure Pressure using pressure cell.
7. Measure flow using Rotameter.
8. Measure of sound using sound meter.
9. Measure of Speed using tachometer/stroboscope/Proximity Switch.
10. Summarize the smart sensors.
11. Measurement of Liquid Level Using Proximity Sensor



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Text Books:

1. A course in Electrical, Electronics measurement and Instrumentation, A.K.Sawhney
2. Mechanical & Industrial measurements, Jain R.K., Khanna Publications, New Delhi.
3. Mechanical measurements & instrumentation, Rajput.R.K., S.K.Kataria and sons, New Delhi.
4. Electronic Instrumentation, H. S. Kalsi, MGH, 3rd Edition

Reference Books:

1. Electronic Instrumentation and Measurement Techniques, Welfrick Cooper.
2. Instrumentation for Engineers And Scientists , John Turner ,II Edition , Wiley
3. Electronic Instrumentation and Measurements, David A Bell, Third Edition, Oxford.
4. Instrumentation for Engineering Measurements, James W Dally, II Edition , Wiley India



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Microprocessors and Microcontrollers Laboratory

23AR2305	PCC	Microprocessors and Microcontrollers Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week	CA-I:15 Marks CA-II :15 Marks Practical and Oral Exam: 20 Marks

Pre-Requisites: Basic Electronics Engineering

Course Outcomes: At the end of the course students will be able to -

CO1	Perform basic Programming and implementation on 8085 Microprocessor.
CO2	Develop 8085 Assembly Language Programs for Arithmetic, Logical, data transfer etc.
CO3	Perform basic Programming and implementation on 8051. Microcontroller.
CO4	Demonstrate an application for 8051 microcontroller using Traffic light controller, ADC & DAC interfacing boards.

List of Experiments:

At least minimum Ten experiments should be performed from the following list.

Microprocessor Lab (At least 3 experiments): Developing Assembly Language Programs using 8085 Microcontroller Kits:

1. Addition and Subtraction using 8085.
2. Multiplication and Division using 8085.
3. Block Transfer and Block Exchange using 8085.
4. Data Conversion using 8085.
5. Even and Odd numbers counting using 8085.
6. Find the largest and smallest number using 8085



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Microcontroller Lab (At least 7 experiments): Developing Assembly Language Programs using 8051 Microcontroller Kits/Software:

1. Arithmetic and Logical operations using 8051Microcontroller
2. Bit manipulation with switch using 8051Microcontroller
3. Toggling of LED/LEDs using 8051Microcontroller
4. Message display on LCD using 8051Microcontroller
5. Generate square wave using 8051Microcontroller
6. Interfacing Traffic light controller using 8051Microcontroller
7. Interfacing Stepper motor using 8051Microcontroller
8. Keypad interfacing using 8051Microcontroller
9. Interfacing temperature sensor using 8051Microcontroller
10. String operations(Serial communication) using 8051Microcontroller

Text Books:

1. Krishna Kant, —Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096l, PHI, 2014.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems Using Assembly and C ", 2nd Edition, Pearson Education 2013.
3. Kenneth J. Ayala, "The 8051 Microcontroller. Architecture, Programming and Applications", 3rd Edition, West publishing company 2014

Reference Books:

1. I.Soumitra Kumar Mandal "Microprocessors and Microcontrollers Architecture Programming and Interfacing using 8085, 8086 & 8051" Tata McGraw Hill Publishing Co Ltd, 1st Edition, 2011.
2. Myke Predko, "Programming and Customizing the 8051 Microcontroller", 1st Edition, 2012.
3. Chris Braith, "8051 Microcontroller Application based Introduction", Elsevier 2004.
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Object Oriented Programming Using C++ Laboratory

23AR2306	PCC	Object Oriented Programming Using C++ Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hours/week	CA-I:15 Marks CA-II :15 Marks Practical and Oral Exam: 20 Marks

Pre-Requisites: Computer Programming in C

Course Outcomes: At the end of the course students will be able to -

CO1	Make use of Class, Object and Constructor-Destructor features of OOP.
CO2	Experiment with Inheritance, Virtual Function and Polymorphism operations in OOPs.
CO3	Develop code to illustrate File Handling and Exception Handling.
CO4	Demonstrate use of Friend Function, Data Abstraction and Data Encapsulation with suitable example.

List of Experiments:

1. Write a C++ program to demonstrate classes.
2. Class Templates
C++ programs using class templates to implement the following using an array.
a) Stack ADT b) Queue ADT
3. Write a C++ program to demonstrate on constructors (default, parameterized and copy Constructor) and destructors
4. Write a C++ program to demonstrate Function Overloading.
5. Write a C++ program to demonstrate operator '+' overloading to find the addition of two complex numbers.
6. Write a C++ program to demonstrate
 - i) single level inheritance
 - ii) multilevel inheritance
 - iii) multiple inheritance
 - iv) Hierarchical inheritance
 - v) Hybrid inheritance
7. Write a C++ program to demonstrate Friend Function.
8. Write a C++ program to demonstrate Polymorphism (Virtual Function).
9. Write a C++ program to demonstrate Data Abstraction.
10. Write a C++ program to demonstrate Data Encapsulation.
11. Write a C++ program to demonstrate Exception Handling.




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12. Write a C++ program to demonstrate different operations in Files & Streams:

- A. Opening a File
- B. Closing a File
- C. Writing to a File
- D. Reading from a File

Text Books:

1. Data structures a pseudo code approach with c++, Indian edition, R.F.Gilberg and B.A.ForouzanCengage Learning.
2. Programming Principles and Practice using C++, B.Stroustrup, Addison-Wesley (Pearson Education)
3. Data Structures and STL, W.J.Collins, McGrawHill, International Edition.
5. Data Structures and Algorithms with OODesign patterns in C++, B.R.Priess, JohnWiley&sons.
6. The Art, Philosophy and Science of OOP with C++, Rick Miller, SPD.
7. C++ for Programmers , P.J.Deitel and H.M.Deitel, PHI/Pearson.

Reference Books:

1. 1.Programming in C Practical Approach by Ajay Mittal, Pearson
2. 2.Let Us C, By Yashwat Kanetkar




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Mini Project-II

23AR2307	CEP	Mini Project-II	0-0-2	01 credit
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Teaching Scheme	Examination Scheme
Practical: 2hrs/week	CA-I:- 25 Marks CA-II: -25 Marks

Pre-Requisites: Mini Project

About Ideathon

The project is a part of addressing societal and industrial needs. An Ideathon is a brief, intense event where students can work on some of the most important problems that the world is facing today. Ideathon's are brainstorming events where people with diverse knowledge backgrounds, skill sets and interests get together to predetermine problems and come up with substantive, innovative and comprehensive solutions. An Ideathon's output might be ideas, a roadmap or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame

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

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Outline the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.

Course Contents:

<p>Week 1: Higher Education and Case Study Pedagogy</p> <ul style="list-style-type: none"> Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. Allocation of mentor 	[2]
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Week 2: Topic Selection <ul style="list-style-type: none">Briefly interact with students to provide hand-holding for topic selection.Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisorIllustrative Examples : Any Industry or Societal ProblemFinalization of Title.	[2]
Week 3: Case Study Design/Ideathon: Part 1 <ul style="list-style-type: none">If needed, provide hand-holding to students for finalizing objectives.Review the objectives of the case study groups.Identify what can be quantified related to your topic and how.Decide objectives for your case study.Continue reading especially recent work specific to your topic.	[2]
Week 4: Case Study Design/Ideathon: Part 2 <ul style="list-style-type: none">Prepare a roadmap of your case study, identify what is to be measured on the field.Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design <ul style="list-style-type: none">Prepare a questionnaire and try it out with your group members as mock.Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 <ul style="list-style-type: none">Students in a group shall understand problem effectively, propose multiple solution.The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 <ul style="list-style-type: none">The students have to finalize the best methodology to solve the problem in consultation with the project guide.25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 <ul style="list-style-type: none">Identify appropriate data visualization tools for your case study.Analyze the data	[2]
Week 9: Analysis-4 <ul style="list-style-type: none">Identify appropriate data visualization tools for your case study.Analyze the data	[2]
Week 10: Report writing Part:1 <ul style="list-style-type: none">Prepare an outline of the report and start organizing the write-up for the first draft.Prepare and submit the first draft of the report to the course coordinator.	[2]
Week 11: Report writing Part:2 <ul style="list-style-type: none">Make necessary corrections if any as per the suggestions of course coordinator.Submit the final draft of the case study	[2]
Week 12: Final Presentation <ul style="list-style-type: none">50% Presentation has to be conducted by mentor/guide based on above activity.	[2]




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Account and Finance Management

23AR2308	HSSM	Account and Finance Management	1-0-0	Audit
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Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	CA-I: 25 Marks CA-II:25 Marks

Pre-Requisites: None

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

CO1	Explain basic terminology used in finance and accounts
CO2	Prepare and appraise Financial Statements and evaluate company in the light of different
CO3	Analyze the risk and return of alternative sources of financing.
CO4	Estimate cash flows from a project, including operating, net working capital, and capital spending
CO5	Estimate the required return on projects of differing risk ,to estimate the cash flows from an investment project, calculate the appropriate discount rate, determine the value added from the project, and make a recommendation to accept or reject the project
CO6	Describe and illustrate the important elements in project finance Using financial calculator and Excel in a variety of problems.

Course Contents:

<p>Unit 1: Introduction to Financial Accounting, Book keeping and Recording Meaning, Scope and importance of Financial Accounting. Financial Accounting - concepts and conventions, classification of accounts, Rules and principles governing Double Entry Book-keeping system, Meaning, Preparation of Journal, Ledger , Cash book and Trial balance. (Practical application on tally)</p>	[2]
<p>Unit 2: Financial Statement Preparation, analysis and Interpretation Preparation of financial statement and Profit and Loss Account, Balance Sheet, Ratio Analysis -classification of various ratios. (Calculation on Excel)</p>	[2]
<p>Unit 3: Introduction To Financial Management Concept of business finance, Goals and objectives of financial management, Sources of financing - LONG TERM: shares, debentures, term loans, lease and hire purchase, retained earnings, public deposits, bonds (Types, features and utility), SHORT TERM: bank finance, commercial paper, trade credit and bills discounting, INTERNAL: Retained earnings</p>	[2]
<p>Unit 4: Working Capital Management Concept of working Capital, significance, types. Adequacy of working capital, Factors affecting working capital needs, Financing approaches for working capital, Methods of forecasting working capital requirements, meaning and importance of accounts receivable.(Excel)</p>	[2]



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Unit 5: Time Value of Money and Capital Budgeting Concept of time value of money, Compounding and discounting; Future value of single amount and annuity, present value of single amount and annuity; Practical application of time value technique. Capital budgeting - Nature and significance, techniques of capital budgeting –Pay Back Method, Accounting rate of return, Internal Rate of Return, DCF, Net Present Value and profitability index. (Application on Excel)	[2]
Unit 6: Project Financing Details of the company, its promoters, and project finances required, profitability etc., Loan documentation-Appraisal of terms loans by financial institutions. Basic components of project finance.(Excel Based)	[2]
Text Books: 1. Financial, Cost and Management Accounting by Dr. P. Pariasamy, HH Publication. 2. Financial Management by Khan and Jain, Tata McGraw Hill. 3. Financial Management by Dr. P. C. Tulsian, S.Chand. 4. Financial Management by Ravi Kishore, Taxmann	
Reference Books: 1 “Book Keeping and Accountancy” Choudhari, Chopde. 2 “Cost Accounting”: Choudhari, Chopde. 3 “Financial Management” Text and Problems: M.Y.Khan, P.K. Jain. 4 “Financial Management Theory & Practice” Prasanna Chandra Tata McGraw Hill. 5 Managerial Economics & Financial Analysis, Siddiqui S.A. Siddiqui A.S. New Age.	




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Modern Indian Language

23MILE01	AEC	Marathi	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA -I :25 Marks CA-II :25 Marks

Pre-Requisites: Nil

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

CO1	Develop the knowledge of local language/mother tongue and relate the same to daily life and social media.
CO2	Make use of rhetoric and verb to form sentences in Marathi Language
CO3	Identity Infinitive compounds in the given Marathi sentence.
CO4	Make use of Phrases and proverbs and form a sentence and Solve Prose Assessment/Summary Writing
CO5	Model a letter to appropriate end user in Marathi Language
CO6	Identity writing type of Marathi stanza and write appropriate writing.

Course Contents:

अध्याय 01:भाषा परीचय भाषा आणि व्यक्तिमत्वसह संबंध, भाषा, जीवन व्यवहार आणि नवमाध्यमे व समाजमाध्यमे, चिन्हव्यवस्था-विरामचिन्हे, संवादकौशल्य (तोंडीपरीक्षा), सर्वनाम-पुरुषात्मक, दर्शक, संबंधी, प्रश्नार्थक, सामान्यव आत्मवाचकसर्वनाम, विशेषण-गुणविशेषण, संख्याविशेषण, सार्वनामीक विशेषण	[4]
अध्याय 02:मराठी व्याकरण नाम, सर्वनाम, विशेषणे, क्रियापद, क्रियाविशेषणअव्यय, शब्दयोगी अव्यय, उभयान्वयी अव्यय, केवलप्रयोगी अव्यय, विभक्ती व त्याचेप्रकार, काळवप्रकार	[4]




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<p>अध्याय 03: अलंकार व क्रियापदे</p> <p>अलंकार-शब्दलांकर- अनुप्रास, यमक, श्लेषउदाहरणे, अर्थालंकार-उपमा, उत्प्रेक्षा, व्यक्तितरेक, अपदुनती, रूपक, व्यक्तितरेक, अननव्य, अतिशयोक्तीउदाहरणेप्रयोग-कर्तरी, कर्मणी, भावेवाक्यप्रकार-केवलवाक्य, मिश्रवाक्य, संयुक्तवाक्यसमास-अव्ययीभाव, तत्पुरुष, द्वंद्व, बह्वृही</p> <p>क्रियापदे- कर्तावकर्म, क्रियापदाचेप्रकार- अकर्मक, सकर्मक, उभयविध, संयुक्त, क्रियाविशेषण-कालवाचक, स्थळवाचक, रितीवाचक, संख्यावाचक, प्रश्नार्थक, निषेधार्थक</p>	[4]
<p>अध्याय 04: वाक्प्रचार व म्हणी व गद्य आकलन/सारांशलेखन</p> <p>अर्थसांगूनवाक्यातउपयोगकरणे (कमीतकमी३०वाक्यप्रचारवम्हणी), गद्यआकलन - अपठितगद्यउतारावत्यावरीलप्रश्नउत्तरे (कमीतकमी०५उतारेवत्यावरीलप्रश्नउत्तरे), सारांशआकलन</p>	[5]
<p>अध्याय 05:लेखनप्रकार</p> <p>पत्रलेखनवत्याचेप्रकार-निमंत्रण, आभार, अभिनंदन, मागणी, कोटुंबिक, विनंती, तक्रार संधी -स्वरसंधी, व्यंजनसंधी, विसर्गसंधी, वृत्तलेखन, जाहिरातलेखन, कथालेखन, अहवाललेखन, आवेदनपत्र, अभिप्रायलेखन</p>	[5]
<p>अध्याय 05: कल्पना विस्तार व मुलाखात</p> <p>कल्पनाविस्तार, मुलाखत कौशल्ये, मुलाखतीचे वैशिष्ट्ये, मुलाखतीचे स्वरूप, मुलाखत घेताना घ्यावयाची काळजी, मुलाखत देताना आवश्यकबाबी उदा. आत्मविश्वास, व्यक्तिमत्व विकास, भाषा कौशल्ये इ.</p>	[4]
<p>Text Books:</p> <ol style="list-style-type: none">1. व्यावहारिक मराठी, डॉ.ल.रा.नसिराबादकर, फडकेप्रकाशन, कोल्हापूर.2. व्यावहारिक मराठी, डॉ.लीला गोविलकर, डॉ.जयश्री पाटणकर, स्नेहवर्धन प्रकाशन, पुणे3. सुगम मराठी व्याकरण लेखन, मो.रा. वाळंबे, नितीन प्रकाशन पुणे	
<p>Reference Books:</p> <ol style="list-style-type: none">1. अनिवार्यमराठीव्याकरण, लेखनवआकलन, डॉ. प्रल्हादलुलेकर, केदारकाळवणे, Pearson पब्लिकेशन्स2. मराठीवङ्गजीअत्यावश्यकनिबंध, प्रा.विजयकुमारवेधपाठक, K'Sagarपब्लिकेशन3. उपयोजितलेखन, मराठी, प्राचीशेंडे, सावलीम्हात्रे, टार्गेटपब्लिकेशन्स	



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23MILE02	AEC	Hindi	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA -I :25 Marks CA-II :25 Marks

Pre-Requisites: Nil

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

CO1	Develop the awareness of Hindi language and relate the same to daily life and social media.
CO2	Identity Infinitive compounds in the given Marathi sentence.
CO3	Make use of Phrases and proverbs and form a sentence in Hindi language.
CO4	Identity the mistakes in grammar of Hindi language and corrections in it
CO5	Make use of rhetoric to form sentences in Hindi Language
CO6	Illustrate the prose and verse in the given literature

Course Contents:

अध्याय 01:हिंदी भाषापरीचय हिन्दीभाषाऔरउसकाविकास, हिन्दीसाहित्यकाइतिहास, भाषाकेविभिन्नमौखिकभाषा, लिखितभाषा, रूप-वर्णमाला, विरामचिन्ह, शब्दरचना, अर्थ, वाक्यरचना, वर्णोंकाउच्चारणऔरवर्गीकरण	[5]
अध्याय 02: समास समास, क्रियाएँ, अनेकार्थीशब्द, विलोमशब्द, पर्यायवाचीशब्द,	[5]
अध्याय 03: मुहावरेएवंलोकोक्ति मुहावरेएवंलोकोक्ति, तत्समएवंतद्भव, देशज, विदेशी, वर्तनी, अर्थबोध	[4]



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अध्याय 04:हिन्दी भाषा में प्रयोगहोनेवालीअशुद्धियाँ	[5]
हिन्दी भाषा में प्रयोगहोनेवालीअशुद्धियाँ,अनेकशब्दोंकेलिएएकशब्द, रस	
अध्याय 05:अलंकार	[4]
अलंकार, छन्द, विशेषणऔरविशेष्य, भाषा-विज्ञान	
अध्याय 06: भाषा-विज्ञान	[4]
भाषा-विज्ञान, हिन्दी पद्य/गद्य रचना व रचनाकार, संज्ञासे अवयव तक, रिक्तस्थानोंकीपूर्ति, क्रमबद्धता.	
Text Books:	
1. हिंदी व्याकरण- पंकमताप्रसदगुरु, प्रकाशनसंस्था, नईदिल्ली	
2. हिंदी साहित्यिक का विद्यनानिक इतिहास-डॉ गणपति चंद्रगुप्त, लोकभारतीप्रकाशन, नईदिल्ली.	
Reference Books:	
1. हिंदीभाषाशिक्षण - संपाहिंदीअध्ययनमंडल, सावित्रीबाई फुले पुणे विश्विद्यालय पुणे, राजकमल प्रकाशन	




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High-Energy Materials Technology

23ARMDA1	PCC	High-Energy Materials Technology	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Mechanical Engineering

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

CO1	Formulate the basis for evaluating competitive and alternative high energy material systems
CO2	Classify the of Energetic materials
CO3	Explain about Experimental Characterization of Explosives.
CO4	Explain about Synthesis of Energetic Materials
CO5	Explain about design of Novel Energetic Materials
CO6	Explain about Energetic Materials of the Future

Course Contents:

<p>Unit 1: Introduction Historical Overview ,New Developments, Polymer-Bonded Explosives ,New High (Secondary) Explosives , New Primary Explosives , New Oxidizers for Solid Rocket Motors , Definitions , Combustion, Deflagration, Detonation — A Short Introduction - Fire and Combustion , Deflagration and Detonation</p>	[4]
<p>Unit2:Classification of Energetic Materials Primary Explosives , High (Secondary) Explosives , Propellant Charges , Rocket Propellants , Chemical Thermal Propulsion (CTP) , Pyrotechnics , Detonators, Initiators, Delay Compositions and Heat-Generating, Pyrotechnics , Light-Generating Pyrotechnics , Decoy Flares ,Smoke Munitions , Near-Infrared (NIR) Compositions</p>	[4]
<p>Unit3: Experimental Characterization of Explosives Sensitivities , Long-Term Stabilities ,Insensitive Munitions ,Gap Test , Classification</p>	[4]
<p>Unit4: Synthesis of Energetic Materials Molecular Building Blocks ,Nitration Reactions, Processing ,Protective Equipment</p>	[4]



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Unit 5: Design of Novel Energetic Materials Classification ,Polynitrogen Compounds , High-Nitrogen Compounds , Tetrazole and Dinitramide Chemistry , Tetrazole, Tetrazine and Trinitroethyl Chemistry , Ionic Liquids , Dinitroguanidine Derivatives , Co-Crystallization 1	[4]
Unit 6: Energetic Materials of the Future Theoretical Basis, Computational Methods ,Thermodynamics ,Detonation Parameters, Combustion Parameters	[4]
Text Books: 1. "Chemistry of High-Energy Materials", by Thomas M. Klapötke, De Gruyter, 2012 2. "Shock Waves Science and Technology Library, Detonation Dynamics- Vol. 6," by Zhang F. Publisher: Springer. 3. "Physics of Shock Waves" by Zel'dovich & Raizer.	
Reference Books: 1. "The Chemistry of Explosives", by Jacqueline Akhavan 2011 2. "High energy materials modeling & simulation", by Andreoni Wanda, Yip Sid-ney. Publisher: Springer, 2020.	




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Computer Architecture and Organization

23ARMDB1	PCC	Computer Architecture and Organization	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Computer Programming

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

CO1	Identify various components of computer and their interconnection.
CO2	Analyze the design of arithmetic & logic unit and understanding of the fixed point and floating point arithmetic operations.
CO3	Explain instruction set architecture and execution cycle and different types of control units.
CO4	Design a pipeline for consistent execution of with minimum hazards.
CO5	Explain memory system design and different types of memories.
CO6	Explain Characteristics of Multiprocessors.

Course Contents:

<p>Unit 1: Introduction Functional blocks of a computer: CPU, memory, input-output subsystems, controls Module. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.</p>	[4]
<p>Unit2: Data representation Signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic</p>	[4]
<p>Unit3: Introduction to x86 architecture. CPU control Module design: hardwired and micro-programmed design approaches. Memory system design: semiconductor memory technologies, Internal memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers program controlled, interrupt driven and DMA, I/O device interfaces –SCSI,USB</p>	[4]



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Unit4: Pipelining Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	[4]
Unit 5: Memory organization Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, write policies. Memory Organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	[4]
Unit 6: Multiprocessors Multiprocessors Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	[4]
Text Books: <ol style="list-style-type: none">1. “Computer Organization and Design: The Hardware/Software Interface” 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.2. . Computer Organization and Embedded Systems, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.3. “Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill.	
Reference Books: <ol style="list-style-type: none">1. M. Morris Mano, Computer System Architecture, Pearson2. Andrew S. Tanenbaum and Todd Austin, Structured Computer Organization, Sixth Edition, PHI M. Murdocca & V. Heuring, Computer Architecture & Organization, WILEY3. John Hayes, Computer Architecture and Organization, McGrawHill	




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Aerospace Engineering Fundamentals

23ARMDC1	PCC	Aerospace Engineering Fundamentals	2-0-0	2 Credits
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Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	CA-I:10 Marks CA-II :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Applied Physics

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

CO1	Explain about Basic Anatomy of an aircraft
CO2	Analyze Aircraft Wings and study of Aircraft Power plants
CO3	Build Aircraft Power plants –Gas Turbine Engines
CO4	Explain Aircraft Structures and Materials –Fuselage and Maintenance
CO5	Explain about Manufacturing Techniques –Conventional and Unconventional
CO6	Analyze and Testing of Aircraft Component

Course Contents:

Unit 1: Introduction and Basic Anatomy of an aircraft History of aviation, early concepts and Modern development ,Classification of flying vehicles, study of Cessna 152 Aircraft, Airspeed and Altitude Indicators-Pitot Static Tube, Attitude Indicators	[4]
Unit2: 2 Aircraft Wings and Aircraft Power plants Types of Wing configurations, Aerofoils and Nomenclature, Components and Sub-assemblies of wings Aircraft Power plants –Piston Engines Principles of operations, Components of piston engines ,Engine disassembly and assembly	[4]
Unit3: Aircraft Power plants –Gas Turbine Engines Principles of operations, Components of piston engines ,Study of gas turbine engines Aircraft Structures and Materials Basic loads acting on aircraft structures, structural members of wing and materials	[4]




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Unit4: Aircraft Structures and Materials –Fuselage Structural members of fuselage and materials, Structural members of Landing gear and materials Aircraft General Maintenance :- A,B,C,D Checks ,Flight inspection procedure, Tools used in aircraft maintaince	[4]
Unit 5: Manufacturing Techniques –Conventional and Unconventional Casting ,Machining , welding Manufacturing techniques –Unconventional 3D Printing ,Electric Discharge Machining, CNC Machining	[4]
Unit 6: Aircraft Component Testing and Analysis Hands on Testing of Aircraft Components, Analysis of Aircraft Parts Testing Results	[4]
Text Books: 1. Shock Waves Science and Technology Library, Detonation Dynamics- Vol. 6, by Zhang F. Publisher: Springer. 2. Physics of Shock Waves by Zel'dovich & Raizer.	
Reference Books: 1. K. G. McConnell and P. S. Varoto, Vibration Testing: Theory and Practice, 2nd ed., John Wiley & Sons, Hoboken, NJ, 2008. 2. Steephen Corda , Introduction to Aerospace Engineering with Flight Test Perspective , John Wiley & Sons,2017 3. Y. M. Timnat, "Diagnostic Techniques for Propulsion Systems," Progress in Aerospace Sciences (Series), Vol. 26, No. 2, 1989, pp. 153–168. 4. K. Yanagawa, T. Fujita, H. Miyajima, and K. Kishimoto, "High Altitude Simulation Tests of LOX-LH2 Engine LE-5," Journal of Propulsion and Power, Vol. 1, No. 3, May–Jun. 1985, pp. 180–186.	




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Shri Shamrao Patil (Yadavkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering
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Yadav (Ichalkaranji)-416121, Dist. – Kolhapur

Aptitude Skills-I

(Verbal Ability)

23HSSM01	VEC	Aptitude Skill I	1-0-0	1 Credit
Teaching Scheme:		Examination Scheme:		
Lecture: 1hr		CA-I: 25 Marks CA-II :25 Marks		

Pre-Requisites: Basic Mathematics

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

CO1	Apply sentence formation rules to spot the error
CO2	Solve the questions based on the types of tenses
CO3	Solve the questions based on Direct/Indirect Speech and Passive/active voice and Substitution and Elimination
CO4	Make use of Proverbs, Idioms and phrases in sentence construction and the vocabulary

Course Contents:

Unit 1: Structure and Types of Sentences, Conditional Sentence	[4]
Unit2: Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[4]
Unit3: Direct and Indirect Speech, Active and Passive Voice, Use of Modal verbs in Sentence Forming, Substitution and Elimination	[4]
Unit4: Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence Vocabulary Building in Various Situations	[4]
Text Books :	
1. Raymond Murphy, Essential English Grammar with Answers, Murphy.	
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)	
Reference Books:	
1. Rao and D,V,Prasada, Wren & Martin High School English Grammar and Composition	
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition	



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Language Skill- I

23HSSM02	VEC	Language Skill- I	0-0-2	Audit
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Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Problem Solving using C programming

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

1	Develop flowchart and Algorithm to solve the given problem statements
2	Develops programs using Data Types and Operators
3	Make use of Decision Making and Looping Statements to develop conditional programs
4	Make use of Arrays to develop programs in C language

List of Experiments:

1. Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Design Algorithms and Flowcharts.
2. Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.
3. Develop programs on Conditional, logical and Bitwise Operators
4. Develop programs on Size of () and typecasting operator.
5. Develop programs on increment and decrement operator.
6. Develop programs on simple if and if-else statement.
7. Develop programs on simple if-else ladder and Nested if-else
8. Develop programs on Switch case statement.
9. Develop programs on For-loop & Nested For-loop.
10. Develop programs on while and do-while loop.
11. Develop programs on one dimensional array.




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12. Develop programs on two dimensional array.
13. Develop programs on string handling functions.

Text Books :

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Pearson Publication

Reference Books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar




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