



IPS ACADEMY- INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute, affiliated to RGPV)

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Scheme of Examination as per AICTE Flexible Curricula

III Semester Bachelor of Technology (B.Tech.)

[Fire Technology & Safety Engineering]

S. No	Course Type	Course Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1	BSC	MA04	Program Specific Mathematics	60	25	15	-	-	100	2	1	-	3
2	PCC	FT01	Building Design and Drawing	60	25	15	-	-	100	3	-	-	3
3	PCC	FT02	Industrial Hygiene and Occupational Health	60	25	15	-	-	100	3	-	-	3
4	PCC	FT03	Essentials of Fire and Rescue	60	25	15	-	-	100	2	1	-	3
5	PCC	FT04	Insurance and Risk Management	60	25	15	-	-	100	2	1	-	3
6	HSMC	HS03	Innovation and Creativity	-	-	-	-	100	100	-	-	2	1
7	LC	FT01(P)	Building Design and Drawing	-	-	-	60	40	100	-	-	2	1
8	LC	FT02(P)	Industrial Hygiene and Occupational Health	-	-	-	60	40	100	-	-	2	1
9	LC	FT03(P)	Rescue Equipments and Techniques	-	-	-	60	40	100	-	-	2	1
10	SBC	FT01(P)	Field Training in Rescue Operations	-	-	-	60	40	100	-	-	2	1
11	LLC	LLC02	Liberal Learning Course –II	-	-	-	60	40	100	-	-	2	1
12	MLC	MLC01	Professional Laws, Ethics, Gender, Human Values and Harmony	-	-	-	-	-	-	1	-	-	Audit
Total				300	125	75	300	300	1100	13	03	12	21
Total Academic Engagement and Credits										28			21

Basic Science Course (BSC), Program Specific Mathematics, (MA04) Numerical Method and Laplace Transform

Liberal Learning Course-II, LLC02 (Any One Course from NSO/NCA)

A. NSO Any one Sports at State Level

B. NCA

Music/Dance/Photography /Cinematography /Podcasting /Theatre/Painting

BSC – MA04	Program Specific Mathematics (a) Numerical Methods and Laplace Transform	2L:1T:0P (03 Hrs)	03 Credits
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Course Objective: The main objective of this course is to teach mathematical modeling of a physical system, Identify appropriate numerical method to find solutions of simulated physical system and apply the numerical methods to solve Engineering problems.

Module-1: Introduction: Basic concepts of Numerical Methods: Mathematical modeling; accuracy and precision; errors analysis. **(8 Hrs)**

Module-2 Roots of Equations: Graphical Methods; Bisection Method; Newton-Raphson Method; Multiple Roots. **(10 Hrs)**

Module-3: Curve Fitting: Least Square Regressions, Interpolation by Newton's Formulae, Lagrange Interpolating Polynomials, Spline Interpolation. **(8 Hrs)**

Module-4 Ordinary Differential Equations: Taylor's Series method; Euler's method; Modified Euler's method, Runge- Kutta method (Second and Fourth Order) **(10 Hrs)**

Module-5 Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations **(12 Hrs)**

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

CO1: Understand basic concepts of Numerical Methods.

CO2: Identify appropriate numerical method to find solutions of simulated physical system

CO3: Evaluate curve fitting, Least Square Regressions

CO4: Recognize and apply the concept of Ordinary Differential Equations

CO5: Find Laplace transformation

Reference Books:

1. Chapra, Cannale, "Numerical Methods for Engineers", 6th edition, McGraw-Hill Int.,
- 2 Sastry S. S., "Introductory Methods of Numerical Analysis", 5th edition, Prentice Hall of India Delhi
- 3 N Krishna Raju Ku Muthu, Numerical Methods For Engineering Problems, 2nd edition, Macmillan
- 4 Children's Books Amos Gilat, "Numerical Methods for Engineers and Scientists", 3rd Edition, Wiley International, 2014
5. Ascher, U.M. and Greif, C., "A First Course in the Numerical Methods", SIAM Publication, 2011.
- 6 Khoury, Richard, Harder, Douglas Wilhelm, "Numerical Methods and Modelling for Engineering"

PCC-FT01	Building Design and Drawing	3L:0T:0P (03 Hrs)	03 Credits
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Pre-requisite(s): Engineering Graphics & Visualization

Course Objective:

Basic necessity for the Building Planning & Drawing is to develop drawing skills and enhance imagination and observation power of students.

Course Content:

Module 1 (08hrs)

DRAWING OF SUB STRUCTURES ELEMENTS: Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation

Module 2 (07 hrs)

DRAWING OF SUPER STRUCTURES ELEMENTS: Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc

Module 3 (09 hrs)

BUILDING FIRE SERVICES: Layout of water tank partition/compartment, Pump house layout-stand by pump, main fire pump and jockey pump arrangements, Cross section of centrifugal pump drawing, hydrant post drawing, Hose box, Hose reel, Dry riser, Wet riser and down comer.

Module 4 (09 hrs)

BUILDING PLANNING: Provisions of National Building Code, Building bye-laws, open area, setbacks, FAR terminology, principle of architectural composition (i.e. unity, contrast, etc.), principles of planning, orientation.

Module 5 (08 hrs)

DRAWING OF VARIOUS BUILDINGS: Planning of residential buildings –Bungalows, Row houses, Ownership flats & Apartments. Elevation & sectional details. Planning Functional requirements of Institutional buildings.

Course Outcome:

At the end of this course student will be able to:

1. Have basic knowledge various components of building construction that relate to the fire service.
2. Draw the visual elements of drawing (line, shape, value, texture, scale, space, etc.)
3. Familiar with National Building Code and bye-laws terminology.
4. Prepared layouts with detailed drawings of various types of buildings
5. Understand basic building services associated with occupancy.

List of Text/Reference Books:

1. Malik & Meo; Building Design And Drawing
2. Shah, Kale & Patki; Building Design And Drawing; Tmh
3. Gurucharan Singh & Jgdish Singh Building Planning, Design And Scheduling

LC-FT01(P)	Building Design and Drawing	0L:0T:2P (02 Hrs)	01 Credits
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List of Experiment:

1. Starting A New Drawing/Opening An Existing Drawing: Setting Up A Drawing Starting From Scratch, Setting Up A Drawing Using A Wizard, Using And Creating A Template File, Opening An Existing Drawing, Screen Layout, Pull-Down Menus, Screen Icons, Command Line, Status Bar, Dialogue Boxes.
2. Drawing Commands: Lines, Ray, Construction Line, Multiline And Polylines, Rectangles, Arc, Circle And Ellipse, Polygon, Spline, Co-Ordinate Input Methods, (Directive, And Absolute, Relative And Polar).
3. Modify Commands: Erase, Trim, Move, Copy, Mirror, Offset, Fillet And Chamfer, Array, Extend, Stretch, Rotate, Break, Scale And Explode.
4. Construction Of Plane And Complex Geometrical Figures: Angles, Triangles, Rhombus, Quadrilaterals, Polygons, Angle Bisectors, Line Divided In Equal Parts, Construction Of Curves And Helix, Principles Of Projections, Projections Of Straight Lines And Solids, Section Of Solids.
5. Drawing Settings And Aids: Layers, Load Line Types, Match Properties, World Ucs And User-Defined, Ucs, Drawing Limits And Units, Blocks, Attributes, Individual Project Drawings Of Hydrant Post, Sprinkler Head, Branch Pipe, Water Monitor, Fire Extinguisher, Hose Fittings And Breathing Apparatus.

PCC-FT02	Industrial Hygiene & Occupational Health	3L:0T:0P (03 Hrs)	3 Credits
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Course Objectives:

1. To have the knowledge of types of storage & handling process of hazardous material.
2. To learn about the understanding of impact of noise during working hours..
3. To have the knowledge to develop confidence for training & workers regarding occupational diseases.
4. To learn about stress related to work hazard.
5. To learn about various communicate risk factor in handling hazardous material. .

Course Content:

Module 1 (08hrs)

INTRODUCTION TO CHEMICAL HAZARDS. Dangerous properties of chemicals, dust, gases, fumes, mists, vapors and smoke. Exposure evaluation and air sampling, There sold limit values. Chlorine Exposure effects. Personal monitoring. Introduction to chemical processes and safety. Storage, Transport and handling of hazardous chemicals. Industrial ventilation. Natural ventilation. Opening in work area.

Module 2 (08hrs)

PHYSICAL HAZARDS. Improper illumination, Thermal radiation, ultra violet radiation, ionizing and non ionizing radiation. Preventive and control measures. Noise-Measurement, Noise-control techniques – Noise Survey, vibration. Thermal stress, heat balance, heat-stress, heat disorders, control measures.

Module 3 (08hrs)

WORK PHYSIOLOGY Classification of workload. Work capacity and man- Job alignment. Fatigue, Physiological tests – diet and exercise for work stress control. Ergonomics, Application of ergonomics in safety and health management, methods of reducing postural strain.

Module 4 (07hrs)

OCCUPATIONAL HEALTH Common occupational diseases such as silicosis, asbestosis, and toxicity related to lead, nickel, chromium, and manganese. Causation of diseases and its effects. Methods of prevention. Compensation of occupational diseases. Occupational dermatitis, occupational cancers, Medical examination of workers, occupational health center, health records, fundamentals of first aid.

Module 5 (09hrs)

PERSONAL PROTECTIVE EQUIPMENTS: Non respiratory personal protective devices: Head protection , Ear protection. Face and Eye protection. Head protection. Feet protection. Body protection. Supply, use, care maintenance of personal protective equipments. Requirements under safety laws. Respiratory personal protective devices: classification of hazards. Selection of respirators. Instructions in use of breathing apparatus. Supply, Training for use, care & maintenance of breathing apparatus

Course Outcome:

At the end of this course student will be able to:

1. Demonstrate the knowledge of types of storage & handling process of hazardous material.
2. Show the understanding of impact of noise during working hours..
3. Develop confidence for training & workers regarding occupational diseases.
4. Understand common occupational diseases with their preventive measures.
5. Communicate risk factor in handling hazardous material.

List of Text/Reference Books:

1. Occupational Health & Safety in manufacturing Industries – M K Potty.
2. Diseases of occupation – D. Hunter.
3. Code of Practice for Hazardous goods by NFPA
4. Dangerous properties of Industrial materials by Irvin Sex.
5. Handbook of occupation Health & Safety NSC Chicago 1982
6. Encyclopedia of occupational Health & Safety Vol I & II I.L.O. Geneva 1985.
7. Human Factors in Engineering & Design Tata McGraw-Hill 1982

LC-FT02(P)	Industrial Hygiene & Occupational Health	0L:0T:2P (02 Hrs)	1 Credits
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List of Experiment:

1. To carry out survey of noise level by Integrated Sound Level Meter.
2. To evaluate the lung function capacity of human body by Spirometer.
3. To monitor the presence of Ammonia and its control measures.
4. To diagnose the personal hearing capability and hearing loss by the use of pure tone audiometer (Arphi 500 series)
5. To detect the presence of flammable gas by the use of flammable gas detection monitor.
6. To carry out the air sampling survey and dust monitoring using air sampling pump.
7. To evaluate noise dose for a personnel working in noisy area with the help of noise dosimeter.
8. To carry out survey of illumination levels by use of Lux meter.

PCC-FT03	Essentials of Fire and Rescue	2L:1T:0P (03 hrs)	03 Credits
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Course Objectives:

1. To give basic concepts of Rescue in Ordinary as well as special situations in Major Disasters.
2. To Understand the Respiratory and Non Respiratory Personal Protective Equipments used by Rescuer in Emergencies.
3. To learn about various types of Fire Dynamics in Fire Scenario.
4. To understand the basic Fundamentals of Fire Propagation.
5. To understand the Chemistry and Physics of fire.

Course Content:

Module 1 (06 Hrs)
CHEMISTRY AND PHYSICS OF FIRE: Principles of Fire, Heat Measurement and Heat Transfer, Fire Growth, Heat Release Rate, Fuel Loading, Classification of Fire, Theory of Fire Extinguishment with Water, Foam, DCP, Inert Gases and Halogenated Agents, Special Case of Fire Extinguishment.

Module 2 (06 Hrs)
FIRE PROPAGATION: Spread of flames in solids and liquids, linear and three dimensional fire propagation; Smoke, Constituents of smoke, quantity and rate of production of smoke, quality of smoke, smoke density, Visibility in smoke, principles of spreading quantity of smoke, smoke movement; Pressurization modeling of smoke movement; Toxicity of smoke- effect of harmful agents preventing escape and causing injury or death - CO, CO₂, Nitrogen oxide, Sulphur dioxide.

Module 3 (08 Hrs)
FIRE DYNAMICS: Introduction- temperature, heat, specific heat, flash point, fire point, ignition, combustion; Ignition pilot ignition, spontaneous ignition, ignition sources; Types of combustion- rapid, spontaneous, explosion; Product of combustion-flame, heat, smoke, fire gases. Development of fire-incipient, smoldering, flame and heat stages; Diffusion flames-zones of combustion, smoldering combustion, characteristics of diffusion flame; Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios, deflagration and detonation, characteristics of premixed flame; Explosion- physical explosion, chemical explosion; Special kinds of combustion- Flash fire, Pool fire, Deep seated fire, Spoilover, Boilover, Slopover, Dust explosion, BLEVE, UVCE; Classification of fire based on material.

Module 4 (09 Hrs)
RESCUE EQUIPMENTS: Head protection, Eye & Face Protection, Hand and Arm Protection, Foot and Leg Protection, Body Protection, Safety Belt and Harness, Ear Protection- The IS specification with types and testing procedure for Head protection, Eye & Face Protection, Hand and Arm Protection, Foot and Leg Protection, Body Protection, Safety Belt and Harness, Ear Protection Equipment. General, Selection, Care & Special precaution for respiratory PPE's, Canister type Respirators (IS 8523-1977), Chemical Cartridge Respirators (IS 8522-1977), Filter Type Particulate Respirators (IS 9473- 1980), Compressed Air Line Breathing Apparatus (IS 10245 Part-V -1982), Self Contained Breathing Apparatus (IS 10245 Part-II- 1982)

Module 5 (05 Hrs)
RESCUE OPERATION: Rescue by ordinary means, Special and unusual type of rescue, Rescue work during major disaster such as high rise building, Highway accident, Water, Sewer and Mines, Nuclear radiation & poisonous gas environment.

Course Outcome:

At the end of this course student will be able to:

1. Demonstrate Rescue Operations by means of Special and unusual type.
2. Apply the proper use of Respiratory and Non Respiratory Personal Protective equipments in emergencies.
3. Explain fire dynamics in enclosed and open fire situations.
4. Explain fire propagation, smoke movement and its effect on surrounding.
5. Know Fire Physics and Chemistry, Fire Propagation and Fire Dynamics.

List of Text/Reference Books:

1. AERB Safety Guideline for Personal Protective Equipments (Govt. of India)
2. Fire Protection Handbook Vol.I Section-I Basics of Fire and Fire Scenario
3. Elementary principles of rescue by Govt. Of India, ministry of Home Affairs
4. Relevant ISI special appliances and equipments
5. Gupta R.S., A Hand Book of Fire Technology,
6. Raymond Friedman Principles of Fire Protection chemistry, National Fire Protection Association, 1996

LC-FT03(P)	Rescue Equipments & Techniques	0L:0T:2P (02 hrs)	01 Credits
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List of Experiment:

1. To perform the filling operation of breathing apparatus using Self contained breathing apparatus (SCBA) refilling machine.
2. To determine the effective working duration of self contain breathing apparatus in a rescue operation
3. To Prepare & construct different types of hitches & knots used in rescue given sample of rope
4. To perform rope rescue operation using safety harness at rescue tower within given duration of time.
5. To determine the incline burning characteristics of fabric with the help of Flammability Tester (Incline Plate)
6. To perform & practice rope climbing and pole climbing operation at rescue tower using appropriate personal protective equipment
7. To demonstrate the different classes of fire and extinguishing techniques.
8. To perform the digital high voltage test for different type of PPE.
9. To perform the shock absorption & penetration test of safety helmet.

PCC- FT04	Insurance & Risk Management	2l:1T:0P (03 Hrs)	03 Credits
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Course Objective:

The objectives of this course are to explain to the student operations of upcoming insurance and banking sector, statutory requirements and understanding of financial environment and market in which they operate.

Course Content:

Module 1 (08 hrs)

INSURANCE AND RISK MANAGEMENT: Introduction to risk, Nature & types of risks, Risk Management Process, Risk and its relation with Insurance, General principles of Insurance, Insurance Terminology, Insurance Application and Acceptance Procedure.

Module 2 (08 hrs)

LIFE INSURANCE: Principles, Products Term Insurance, Endowment Insurance, Pensions, Annuities. Claim Management, Premium payment lapse and Revival, Premium Calculations, Concept of Mortality tables, Assignment, Nomination, Loans, Surrenders, Foreclosure, Reinsurance, Bank assurance, Underwriting Actuarial Profession.

Module 3 (09 hrs)

GENERAL INSURANCE: Principles, Products Fire, Marine, Motor Vehicles, Public Liability, Commercial, Medi-claim and Health Policies, Group Insurance, Crop Insurance etc.

Module 4 (08 hrs)

LIFE INSURANCE POLICIES: Applications in different situations; Important life insurance policies; Life insurance annuities; Important legal provisions and judicial pronouncements 20% in India.

Module 5 (06 hrs)

INSURANCE REGULATORY AND DEVELOPMENT AUTHORITY (IRDA): Functions & importance of IRDA, Legislation on Advisors, Brokers, Corporate Agents, Agents, TPA, Recent developments.

Course Outcome:

At the end of this course student will be able to:

1. Understand the principles of Insurance and their applications.
2. Describe fundamental theories on life insurance.
3. Demonstrate the basic concepts of general insurance.
4. Understand the life insurance policies and judicial pronouncements in India.
5. Describe function and importance of IRDA

List of Text/Reference Books:

1. M. N. Mishra; Insurance Principles & Practice; S. Chand & Co. New Delhi
2. R. M. Shrivastava; Management Of Indian Financial Institutions; Himalaya Publications, New Delhi
3. Arondekar; Principles Of Banking; Iibf; Macmillan India Ltd.
4. Ajay Kumar; Risk Management; Iibf; Macmillan India Ltd.
5. Timothy Koch And S. Mac Donald "Bank Management" New York, Dryden Press
6. Mishra M. N. Life Insurance Corporation Of India- I, Ii & Iii Vol. Raj Book & Subscription, Jaipur

HSMC-HS03	Innovation and Creativity	1L:0T:0P (01 Hrs)	01 Credit
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Pre requisite(s): Nil

Course Objectives:

1. To give an insight into creativity and innovation
2. To develop an appreciation for innovation among students, and
3. To enhance sensitivity to creativity and innovation

UNIT I: Overview of Creativity

Meaning and concept of creativity, Process, Nature and characteristics of creativity, Factors affecting creativity.

UNIT II: Overview of Innovation

Difference between Invention & Innovation, Importance & Principles of Innovation, Process of Innovation, Domain wise Innovations, How to safe guard innovations.

UNIT III: Tools for Innovation

Traditional V/s Creative Thinking, Individual Creativity Techniques: Meditation, Self-Awareness, & Creative Focus Group Creative Techniques: Brain Storming, off The Wall Thinking

UNIT IV: Evaluation of Effectiveness of Innovation- Legal Aspects like IPR, patent filing, copyright, Patenting Procedures, Design patents etc.

UNIT V: Innovation Management

Concept, Scope, Characteristics, Evolution of Innovation Management, Significance, Factors Influencing Innovation. Organizational Aspects- Economic Aspects like venture capital, angel investors.

Case Studies on Innovation business ideas i.e. RedBus, Flipcart, Ola, Big Basket, Patented products, Chemical products and Materials, special patents of procedures.

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

1. Analyze creativity concepts and principles & process for problem solving.
2. Understand innovation & apply creativity for innovation.
3. Understand innovative products or services.
4. Apply design thinking tools techniques for IPR.
5. Understand the concept of Innovation Management.

Text Books:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, “Introduction to Design Thinking”, Tata Mc Graw Hill, First Edition,2019.
2. Kathryn McElroy, “Prototyping for Designers: Developing the best Digital and Physical Products”, O’Reilly, 2017.

Reference Books:

1. Michael G. Luchs, Scott Swan, Abbie Griffin, “Design Thinking – New Product Essentials from PDMA”, Wiley, 2015.
2. Vijay Kumar, “101 Design Methods: A Structured Approach for Driving Innovation in Your Organization”, 2012.

SBC-FT01(P)	Field Training In Rescue Operations	0L:0T:2P (2 HRS)	01 Credit
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Course Objectives:

1. To understand the Aim, Principle & Instruction Method of Squad Drill.
2. To perform the position of Attention, Stand at Ease, Stand Easy, Sizing, Right dress, Dismiss, Step forward/backward March and Side step.
3. To understand the tricks of Parade Inspection, how & whom to salute and perform the position of Saluting.

Course Content:

Module 1

(06hrs)

INTRODUCTION: Aim of drill, The Principle of good Instructions, Words of command, Timing and Techniques for Instructions..

Module 2

(06hrs)

POSITION: Attention, Stand at ease, Stand easy, Turning and Inclining, Dressing, Forming up in Three ranks, Numbering, Open and Close order March, Sizing.

Module 3

(06hrs)

MARCHING: Length of pace and time of marching, Marching in quick time, Elementary instruction, Regular pace, Halt, Marching in slow time, Position in marching.

Module 4

(09hrs)

CHANGING, BREAKING AND TURNING: Changing step in slow march, changing step in quick march, Breaking into slow march, Breaking into quick march, Turning and Diagonal march in slow time and quick time

Module 5

(09hrs)

FORMING: Forming squad on the march in slow and quick time, Marching of in single file, Reforming in three ranks. Practice for word of command, Correction of Faults, Inspection and Handling a Squad, Application of Instruction Techniques, Organizing Instructional Periods.

Course Outcomes:

At the end of this course student will be able to :

1. Conduct Squad Drill of Fire Fighting Crew in an Organization.
2. Trained Fire Fighting crew in different Squad Drills.

List of Text/Reference Books:

1. Drill Manual For Fire Services Of India By Govt. Of India.
2. Fire Fighters Skill Drill Manual By Nfpa

List of Experiment:

1. To Study the Aim, Principle, Instruction Method of Drill
2. To perform the position of Attention, Stand at Ease, Stand Easy, Sizing, Right dress, Dismiss, Step forward/backward March and Side step.
3. To perform the position of March and pace, Turning by numbers, Mark Time, The Halt, Marching in squad, Quick March and The Halt (on the move).
4. To perform the position of 'Right (or Left) ---Turn', Changing direction by wheeling and Changing steps on the March, Forming File from Single File and Forming Single File from File.
5. To study the tricks of Parade Inspection, how & whom to salute and perform the position of Saluting.

LLC-LLC02	Liberal Learning Course –II	0L:0T:2P (2 HRS)	01 Credit
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Any One Course from NSO/NCA)

National Sports Organization (NSO) Any one Sports at State Level

National Cultural Appreciation (NCA)

- a) Music
- b) Dance
- c) Photography
- d) Cinematography
- e) Podcasting
- f) Theatre
- g) Painting

MLC-MLC02	Professional Laws, Ethics, Gender, Human Values and Harmony	1L:0T:0P (1 HRS)	00 Credit
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