(TR501) INDUSTRIAL TRAINING

1. COURSE OBJECTIVES:

The students need to have industry exposure, where they can experience real life situations related to Man, machine and materials. It is a Training programme designed to expose & prepare the students for the Industrial work situation. This exposure and hands on experience, will further encourage the studentsto take up the industrial projects and enhance their prospects for better employment in their relevant fields.

2. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(TR501) INDUSTRIAL TRAINING	L	T	P	H	TH	TM	TW	PR/OR	
	-	-	15	15	-	-	70	30	GRADE

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

TR501.CO1: Describe the functioning of various departments and processes in the

industry. TR501.CO2: Demonstrate interpersonal skills to achieve the desired

objectives.

TR501.CO3: Use trending software and hardware technologies

TR501.CO4: Prepare technical documents related to the work undertaken or observed.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life -long Learning
TR501.CO1	3	2	1	3	2	2	2
TR501.CO2	2	1	1	2	2	3	3
TR501.CO3	3	3	3	3	3	3	3
TR501.CO4	2	1	1	2	1	3	3

Relationship: Low-1   Medium-2   High-3

	PSO1	PSO2
TR501.CO1	3	3
TR501.CO2	2	3
TR501.CO3	3	3
TR501.CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	**M**	**Thr**	**CO**
	Students are required to study and have hands-on experience wherever possible in the following areas (depending on availability): 1. Company Profile 2. Organizational Structure 3. Company Product Range 4. Manufacturing Facilities Available /Services provided 5. Plant / Facility Layout 6. Operations / Production Processes 7. Production Planning and Control 8. Detail study of Latest Equipment/ Technologies Used 9. Stores Functions 10. Material Handling Systems/ Equipments 11. Quality Management Systems / Functions 12. Maintenance and Repair Practices 13. Safety Practices / Safety Equipments 14. Utilities 15. Logistics 16. Sales and Marketing 17. Ethics, Statutory Rules and Regulations followed 18. Product Design and Development 19. Any other area specific to the Industry providing Training			CO1, CO2, CO3, CO4

6. COURSE DELIVERY:

The Course will be delivered through placement of the students in various industries

7. TERM WORK & PRACTICALS

Evaluation Scheme					
TW				**PR/OR**	
Attendance Marks*	Industrial Mentor's assessment Marks	Institute Mentor's assessment Marks	Training Report	Report Assessment & Seminar/Viva	TOTAL Marks
10	**20**	**20**	**20**	**30**	**100**

* 01 mark shall be deducted for every Absence (with or without permission).

Daily Dairy:

The daily dairy should-be maintained in a book. It should reflect the day to day activities performed by the student (including task, men and materials involved). It should be counter signed by the Industry Mentor. It will become the basis for writing reports on the complete training.

Training Report

The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy,detailed drawings, working drawings, photographs, safety precautions, techniques for work minimizationon site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately high lightened, including environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound. Assessment of Training Report be based on Knowledge, Presentation and Quality of contents and Sketches.

Note:

a. Student/s undergoing Industrial Training shall follow Rules and Regulations of the Industry.

b. Industrial Training will generally be organized and conducted in accordance with Industrial Training Manual duly prescribed by the Board.

8. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS

Unit No	Name of the Unit	Teaching Hours	Marks
1	**PR/OR**	**08 weeks**	**30**
2	**TW**		**70**
	Total	**08 weeks**	**100**

Note:

1. For Industrial training Grades will be awarded based on marks scored as follows:

    80% and above Marks – Grade 'A'60% to 79% Marks – Grade 'B' 40% to 59% Marks – Grade 'C' Marks below 40% - Grade 'D'

2. TW and PR/OR shall be separate heads of passing. Student has to secure minimum Grade 'C' for passing.

(CM501) COMPUTER SECURITY

1. **COURSE OBJECTIVES:** In this course the students will learn the basic concepts of computer security, types of attacks and fundamentals of Cryptography.

2. **PRE-REQUISITES:** Knowledge of Mathematics and Data Communications and Computer Networks

3. **TEACHING AND EXAMINATION SCHEME**

Semester	V					Examination Scheme				
Course code & course title		Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
CM501 Computer Security		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	-	125

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM501.CO1: List the various computer security threats, attacks, cryptographic techniques, Internet security protocols and systems.

CM501.CO2: Identify different types of security threats, attacks, internet security protocols andsystems.

CM501.CO3: Use different cryptography techniques and network security systems.

CM501.CO4: Implement internet security solution in a web-based application and computernetworks.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM501.CO1	2	2	1	1	1	1	2
CM501.CO2	3	2	1	2	1	1	2
CM501.CO3	2	2	1	2	2	2	2
CM501.CO4	2	2	2	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM501.CO1	1	2
CM501.CO2	2	2
CM501.CO3	2	2
CM501.CO4	2	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT	**M**	**Thr**	**CO**

UNIT I	**1. INTRODUCTION TO THE CONCEPTS OF SECURITY**
	1.1 The need for security- Basic Concepts
	1.2 Security management practices
	1.3 Principles of security- confidentiality, authentication, integrity, non-repudiation, access control, availability, Ethical and legal issues.
	1.4 Types of attacks
	    1.4.1 A general view- criminal attacks, publicity attacks, legal attacks.
	    1.4.2 A technical view- Theoretical concepts: interception, fabrication, modification, interruption, Passive and active attacks
	    1.4.3 Practical side of attacks- Application level attacks, network level attacks
	    1.4.4 Programs that attack- virus, worms, Trojan horse.
	    1.4.5 Specific attacks- sniffing and spoofing, phishing, pharming.
	1.5 User Authentication mechanism
	    1.5.1 Introduction and authentication basics
	    1.5.2 Password – Introduction, Clear text password – working and problems
	    1.5.3 Problems with passwords
	    1.5.4 Biometric Authentication: Introduction, Working of Biometric, Biometric techniques - Physiological and behavioral techniques
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT II	**2. CRYPTOGRAPHY TECHNIQUES**
	2.1 Introduction- cryptography, cryptanalysis, cryptology.
	2.2 Plain Text and cipher text
	2.3 Substitution techniques: Caesar Cipher
	2.4 Transposition techniques
	    2.4.1 Rail-fence technique
	    2.4.2 Simple columnar transposition technique
	2.5 Encryption and decryption
		15	10	CO1,
				CO2,
				CO3,
				CO4

	2.6 Symmetric and asymmetric key cryptography
	    2.6.1 Problem of key distribution
	2.7 Steganography
	2.8 Key range and key size
	2.9 Possible type of attacks
	    2.9.1 Cipher-text only attack
	    2.9.2 Known plain-text attack
	    2.9.3 Chosen plain-text attack
	    2.9.4 Chosen cipher-text attack
	    2.9.5 Chosen-text attack.
	2.10 Algorithm types and modes
	    2.10.1 Algorithm types- stream ciphers and block Ciphers
	    2.10.2 Algorithm modes- Electronic Code book, Cipher chaining, Cipher Feedback mode			

UNIT III	**3. SYMMETRIC KEY AND ASYMMETRIC KEY CRYPTOGRAPHY, MESSAGE AUTHENTICATION AND HASH FUNCTIONS**
	3.1 An overview of symmetric-key cryptography
	3.2 Data encryption standard (DES) – Basic Principles
	3.3 Overview of asymmetric–key cryptography
	3.4 Asymmetric –key cryptography algorithms- The RSA Algorithm
	    3.4.1. Introduction
	    3.4.2. Examples of RSA
	    3.4.3. Security of RSA- Plain-text attacks, chosen-cipher text attack, factorization attack, attacks on the encryption key, attack on the decryption key.
	3.5 Comparison between symmetric and asymmetric key cryptography
	3.6 Digital signatures
	    3.6.1 Introduction
	    3.6.2 Message digests (Hash Functions): Introduction, Idea of a message digests, Requirements of a message digest.
	3.7 Problems with public key exchange.
	3.8 Digital certificates
	    3.8.1 The concepts of digital certificates,
	    3.8.2 Certification Authority (CA)
	    3.8.3 Technical details of a digital certificate.
		15	10	CO1, CO2, CO3, CO4

UNIT IV	**4. INTERNET SECURITY PROTOCOLS AND EMAIL SECURITY**
	4.1 Secure Socket Layer (SSL)
	    4.1.1 Introduction
	    4.1.2 The position of SSL in TCP/IP protocol suite
		15	9	CO1, CO2, CO3, CO4

	4.1.3 The working of SSL: The handshake protocol, The record protocol, The Alert protocol
	4.1.4 Closing and resuming SSL connections
	4.2 Secure Electronic Transaction (SET)
	    4.2.1 Introduction
	    4.2.2 SET participants
	    4.2.3 SET Process
	4.3 Email Security
	    4.3.1 Privacy Enhanced mail – Introduction, working of PEM
	    4.3.2 Pretty Good Privacy (PGP) – Working of PGP			

UNIT V	**5. INTRUSION DETECTION AND FIREWALL**
	    5.1 Intruders - Masquerader, misfeasor, clandestine user
	    5.2 Audit records
	    5.3 Intrusion detection
	        5.3.1 Statistical anomaly detection
	        5.3.2 Rule based detection
	        5.3.3 Honey pots
	    5.4 Firewalls
	        5.4.1 Introduction and Characteristics
	        5.4.2 Types of Firewalls- Packet Filters, Application Gateways (Working)
	        5.4.3 Demilitarized Zone (DMZ) Networks
	        5.4.4 Limitations of firewall
		15	9	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks

I	**1. INTRODUCTION TO THE CONCEPTS OF SECURITY**
	    1.1 The need for security- Basic Concepts
	    1.2 Security approaches-trusted systems
	    1.3 Security models- No security, Security through obscurity, host security, network security.
	    1.4 Security management practices
	    1.5 Principles of security- confidentiality, authentication, integrity, non-repudiation, access control, availability, Ethical and legal issues.
	    1.6 Types of attacks
	    1.7 User Authentication mechanism
		10	15

II	**2. CRYPTOGRAPHY TECHNIQUES**
	    2.1 Introduction- cryptography, cryptanalysis,
	        cryptology.
	    2.2 Plain Text and cipher text
	    2.3 Substitution techniques: Caesar Cipher
	    2.4 Transposition techniques
	    2.5 Encryption and decryption
	    2.6 Symmetric and asymmetric key cryptography
	    2.7 Steganography
	    2.8 Key range and key size
	    2.9 Possible type of attacks
	    2.10 Algorithm types and algorithm modes
		10	15

III	**3. SYMMETRIC KEY AND ASYMMETRIC KEY CRYPTOGRAPHY, MESSAGE AUTHENTICATION AND HASH FUNCTIONS**
	    3.1 An overview of symmetric-key cryptography
	    3.2 Data encryption standard (DES)
	    3.3 Overview of asymmetric–key cryptography,
	    3.4 Asymmetric –key cryptography algorithms- The RSA Algorithm
	    3.5 Comparison between symmetric and asymmetric key cryptography
	    3.6 Digital signatures
	    3.7 Digital Signature Techniques **-** RSA and Digital Signature
	    3.8 Problems with public key exchange.
	    3.9 Digital certificates
		10	15

IV	**4. INTERNET SECURITY PROTOCOLS AND EMAIL SECURITY**
	    4.1 Secure Socket Layer (SSL)
	    4.2 Secure Hyper Text Transfer Protocol (SHTTP)
	    4.3 Secure Electronic Transaction (SET)
	    4.4 Email Security
		9	15

V	**5. INTRUSION DETECTION AND FIREWALL**
	    5.1 Masquerader, misfeasor, clandestine user
	    5.2 Intrusion techniques: one-way encryption/function, access control
	    5.3 Intrusion detection
	    5.4 Firewalls
		9	15

	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Write a program to apply XOR logic on the given string (char pointer) and display the result.
2	Write a program to encrypt and decrypt data using Caesar Cipher.
3	Write a program to encrypt and decrypt data using Rail-fence technique.
4	Write a program to implement simple columnar transposition technique.
5	Write a program to implement Symmetric and Asymmetric key cryptography algorithm logic using in-built functions.
6	Study of attacks on security.
7	Study and implementation of in-built message digest functions in PHP and Java.
8	Study of Internet Security Protocols.
9	Case study on Intrusion Detection.
10	Study of Firewall.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Atul Kahate	Cryptography and Network Security	Tata McGraw-Hill
2	William Stallings	Cryptography and Network Security, Principles and Practice	Prentice Hall
3	Nina Godbole	Information Systems Security: Security Management, Metrics, Frameworks and best practices	Wiley India Publications.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Rick Lehtinen, Deborah Russell, G.T. Gangemi Sir	Computer Security Basics	Oreilly
2	Dieter Gollmann	Computer Security	Wiley
3	Alan G. Konheim	Computer Security and Cryptography	Wiley

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/computer_security/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=5jpgMXt1Z9Y
2	https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7

(CC502) ESSENTIALS OF ENTREPRENEURSHIP DEVELOPMENT

1. COURSE OBJECTIVES:

Today Entrepreneurship is given importance by the government to bring the youth of our country to overcome the problem of unemployment and bring them in the main stream of global business to strengthen Indian economy by Make in India philosophy. Government has announced various financial schemes for young youth and women to support them for setting up an enterprise. To fulfill this, youth are to be prepared for setting an enterprise. The students undergoing this course will be able to develop entrepreneurial traits and confidence within themselves and choose entrepreneurship as a career to brighten their future.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	H	-	-	PR/OR	TW	
(CC502) ESSENTIALS OF ENTREPRENEURSHIP DEVELOPMENT	-	-	2	2	-	-	-	25	25

3. COURSE OUTCOMES:

CC502.CO1: Recognize the type of entrepreneur and enterprises. CC502.CO2:

Describe basic financial & legal aspects of business. CC502.CO3:

Conceptualize a business idea.

CC502.CO4: Develop the project report for new enterprise.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CC502.CO1	1	0	0	0	2	3	2	1	2
CC502.CO2	2	0	0	0	0	3	2	1	2
CC502.CO3	0	1	2	0	0	0	2	1	2
CC502.CO4	3	2	2	0	2	0	2	1	2

Relationship: Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS

M=Marks	Phr= Practical hours	CO – Course Outcomes			
Unit			**M**	**Phr**	**CO**
1.INDIAN BUSINESS ENVIRONMENT					
1.1 Introduction to Entrepreneurship Development (EDP) 1.2 Brief details of following terms: India GDP, IIP data, Govt. business policies, Environmental policy, Effects of global policies, Anti-dumping duty, Effects of national budget on start-ups and businesses.				4	CO1
2. VARIOUS TYPES OF BUSINESSES					
2.1 Brief details of following businesses: Cyclical and Non-cyclical business, Seasonal and Non-seasonal business, Monopoly and Duopoly business, Concept base business, Commodity and Non-commodity business, Asset light business, b2b and b2c business, 2.2 Difference between Subsidiary and Associate company				6	CO1
3. SELECTION OF BUSINESS					
3.1 Types of Sectors, Steps in sectoral analysis, factors to pick up a Sector, Data collection of Sectors. 3.2 Terminologies: Sector rotation, Gross block addition. 3.3 Steps to read Outline of balance sheet, profit-loss statement, cash flow statement. 3.4 Data analysis on following factors: i) Market growth ii) Sector consolidation. 3.5 Brief details of following: Profitability, Effect of Govt policies, Pricing power, Debt, working capital, return on capital employed, Cash conversion cycle, Companies with peer group.				4	CO1 CO2
4 SETTING UP OF BUSINESS					
4.1 Various Govt depts. and organization supporting business ideas. 4.2 Methods to raise capital (difference between Banks and NBFC). 4.3Factors in machine, material, manpower procurement, advertising, product specialty, 4.4 Micro, Small and Medium Enterprises (MSME), Govt support for MSME, Private Limited and Public Limited Enterprises, 4.5 Goods & Service Tax(GST), Registering for GST and go ahead, 4.6Various income tax slabs, 4.7Application for various utility connections, various permissions required to set up business.				10	CO1 CO2 CO3
5. EXPANSION OF BUSINESS					
5.1Types of investors: angel investors, venture capitalist, promoters. 5.2Terminology: 5.2.1 EPS, EPS growth, P/E ratio, 5.2.2 Market capital, paid up capital, authorized share capital, 5.2.3Corporate governance, Related party transactions, business insiders, assets and inventory turnover, break even analysis, brown field and green field expansion.				8	CO1 CO2 CO3 CO4

5.3 Listing start up on stock exchange &Govt support. 5.4 Business report writing, Reading of Red Herring prospectus		
Total	32	

6. COURSE DELIVERY:

Videos / Lectures/ Practicals /Expert lectures / Industry visits/ documentaries/moviesSuggested expert talk on

- various Govt schemes
- GST
- Financial literacy
- Any relevant topic

7. SPECIFICATION TABLE FOR PRACTICALS

Unit No.	Topic	Teaching Hours/ Semester
1	Indian business environment	4
2	various types of businesses	6
3	selection of business	9
4	Setting up of business	9
5	Expansion of business	4
TOTAL		32

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICAL HOURS

No	Classroom Assignments	Marks
1.	Prepare a Case Study on leading enterprise or small-scale unit	**6**
2.	Prepare a report on various government schemes for startup.	**4**
3.	Prepare SWOT analysis for a new business idea.	**5**
4.	Prepare Project Report for a new business idea.	**10**
OR		
1.	Preparing a project report on basis of draft Red Herring prospectus	**25**

9. LEARNING RESOURCES

S. No.	Author	Title of Books	Publisher
1.	Sharadjawadekar, shobhadodlani,	Business entrepreneurship	Suvichar prakashan mandal pune,
2.	S.S. Khanna	Entrepreneurship development	S. Chand & Co. Ltd, New Delhi,
3.	Vasant Desai	Management of small-Scale Industry in India	Himalaya Publishing House
4.	Dilip Sarwate	Entrepreneurial development Concepts and practices	Everest Publication House, Pune
5.	CB Gupta and P Srinivasan	Entrepreneurship Development	S. Chand and Sons, New Delhi

Internet and Web Resources

S. No.	Description
1	https://ncert.nic.in/ncerts/l/leac203.pdf
2	https://ncert.nic.in/ncerts/l/leac204.pdf
3	https://www.wirc-icai.org/images/publication/IND-AS-BOOK.pdf
4	https://cma.org.sa/en/Awareness/Publications/booklets/Booklet_4.pdf
5	https://www.icsi.edu/media/portals/25/IPO.pdf
6	https://old.mu.ac.in/wp-content/uploads/2017/01/FINANCIAL-STATEMENT-ANALYSIS.pdf
7	https://ncert.nic.in/textbook/pdf/jess202.pdf
8	https://dea.gov.in/sites/default/files/
10	https://dea.gov.in/monthly-economic-report-table
11	https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/0HSIE_F.PDF
12	https://ncert.nic.in/textbook/pdf/lebs202.pdf
13	https://www.oecd.org/industry/inv/investmentfordevelopment/33806126.pdf
14	https://www.youtube.com/watch?v=NV8Ew6PcQhY
15	file:///C:/Users/User/Downloads/1-s2.0-S0970389617304664-main.pdf

(CC601) INDUSTRIAL ORGANISATION AND MANAGEMENT

1. COURSE OBJECTIVES:

Management is the basic need of any organization. Organization consists of multiple activities which are to be systematically managed for effective output. The course covers various principles related to organization and management. The areas covered are finance, human resource, project management etc. After completion of the course, the student will be acquainted with management and other related aspects so that he/she will be able to apply this knowledge in order to achieve the organizational goals.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CC601 INDUSTRIAL ORGANISATION AND MANAGEMENT	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	-	3	75	25	-	-	100

3. COURSE OUTCOMES

On successful completion of the course, the student will be

able to: CC601.CO1: Describe types of business

organizations.

CC601.CO2: Apply the principles of managing Men, Machines, and Materials in an

industry.CC601.CO3: Evaluate financial status of an industrial organization.

CC601.CO4: Develop problem solving skills in project management**.**

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
CC601.CO1	2	0	0	0	0	1	0	1	2
CC601.CO2	2	1	1	1	1	2	2	1	2
CC601.CO3	3	2	1	2	3	3	2	1	2
CC601.CO4	3	3	2	2	2	3	3	2	2

Relationship: Low-1   Medium-2 High-3

5. DETAILED COURSE CONTENTS/ MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO= Course Outcomes		
Unit		M	Thr	CO
1. BUSINESS ORGANIZATION **1.1** Types of business organizations: Individual proprietorship, Partnership, Joint Stock Companies: Private Ltd and Public Ltd, Co-operative societies, Public sector **1.2** Structure of business organization: Line organization, Functional Organisation, Line and staff organization, Project organization		10	6	CO1 CO2
2. BUSINESS MANAGEMENT **2.1 :** Concept of management and administration, management as an art and science, evolution and growth of scientific management- contribution of F.W Taylor. **2.2** Basic functions of management: planning, organizing, staffing, directing, controlling. Other functions: forecasting, coordinating and decision- making. **2.3** Functions in Industry: Basics of Procuring, store- keeping, material handling, production, packing and forwarding, marketing and sales, supervision, research and development. **2.4** Supervisory skills required in industry		16	9	CO1 CO2 CO3
3. BASICS OF FINANCE **3.1** Sources of finance **3.2** Cost Concepts: Necessity of costing, elements of cost: material, Labour and expense; prime cost, overhead cost, total cost, And break-even analysis. **3.3** Materials management: Inventory control-standard order, reserve stock, reorder point, lead time. Economic order quantity, ABC Analysis. Introduction to Just in time (JIT) system **3.4** Depreciation: Definition and causes. Methods of calculating depreciation charges: Straight Line Method, Diminishing Balance Method, Sinking Fund method .(Simple Numericals) **3.5** Obsolescence- definitions and reasons. **3.6** Introduction to GST.		18	13	CO1 CO2 CO3 CO4
4. HUMAN RESOURCE MANAGEMENT **4.1** Functions of Personnel Department**:** Human resource planning, selection and recruitment, training, promotion and transfer, welfare of employees. **4.2** Industrial Relations**:** Employer-employee relations, trade union, settlement of disputes of employees, collective bargaining, conciliation, arbitration, grievance handling mechanism. **4.3** Wages and Incentives**:** Factors influencing wages, types of wage plans – time rate and piece rate, Incentive – objectives and types, individual and group incentive plan, characteristics of a good wage or incentive plan, difference between incentive and wage. **4.4** Industrial Acts: Introduction to the following Industrial Acts: Industrial Disputes Act 1947/1956;		21	14	CO1 CO2 CO3 CO4

The Indian Factories Act 1948 The Workmen's Compensation Act 1923			
5.PROJECT MANAGEMENT **5.1** Introduction to Project Management **5.2** Network Analysis (Introduction to basic concepts with simple Numericals) CPM- Critical Path Method: Definition, network diagrams, critical path, advantages PERT- Programme Evaluation and Review Technique: Definition, network diagrams, advantages. Comparison of PERT and CPM.	10	6	CO1 CO2 CO3 CO4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Business Organization	6	10
2	Business Management	9	16
3	Basics of Finance	13	18
4	Human Resource Management	14	21
5	Project Management	6	10
	Total	48	75

8. LEARNING RESOURCESText

Books

S.No	Author	Title of Book	Publisher
1	O.P. Khanna	Industrial Engineering and Management	DhanpatRai Publications
2	T.R.Banga ,S.C. Sharma	Industrial Organisation and Engineering Economics	Khanna Publishers
3	Awate,Chunawala, Patel,Bhandarkar, Sriniwasan	Industrial Organisation and Management	Vrinda Publication
4	Martand Telsang	Industrial Engineering and Production Management	S.Chand& Company Ltd

ELECTIVE I

Elective–I	
Course Code	**Course**
CM511	Data Structures
CM512	E-Commerce
CM513	FOSS (Free and Open Source Software)
CM514	Embedded System Design

(CM 511) DATA STRUCTURES

1. **COURSE OBJECTIVES:** In this course the students will learn the basic concepts of data structures, types of data structures, searching and sorting techniques.

2. **PRE-REQUISITES:** Computer Programming

3. **TEACHING AND EXAMINATION SCHEME**

Semester	V								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CM 511 Data Structures	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM511.CO1: Select appropriate data structures as applied to specified problem definition.

CM511.CO2: Implement operations like insertion, deletion and traversing mechanism on variousdata structures.

CM511.CO3: Implement appropriate searching, sorting technique for a given problem.

CM511.CO4: Use linear and non-linear data structures like stacks, queues, linked lists, trees,

graphs.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM511.CO1	2	2	1	1	1	1	2
CM511.CO2	2	2	2	3	1	1	2
CM511.CO3	2	3	2	3	1	1	2
CM511.CO4	2	3	2	3	1	1	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM511.CO1	1	2
CM511.CO2	2	2
CM511.CO3	2	2
CM511.CO4	2	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
UNIT		**M**	**Thr**	**CO**
UNIT I	**1 INTRODUCTION TO DATA STRUCTURES** 1.1 Introduction 1.2 Definition of Data Structures 1.3 Types of Data Structures 1.4 Data Structure Operations 1.5 Algorithms 1.6 Types of Algorithms- Brute force, divide-and-conquer, Greedy Algorithms, backtracking 1.7 Space and Time complexity 1.8 Asymptotic Notation	15	10	CO1, CO2, CO3, CO4
UNIT II	**2 STACKS AND QUEUES** 2.1 Stacks 2.1.1 Introduction to Stack 2.1.2 Stack operations 2.1.3 Stack implementation 2.1.4 Application of Stacks 2.2 Queues 2.2.1 Introduction 2.2.2 Queue basics 2.2.3 Queue implementation 2.2.4 Basic Concepts of Circular queue 2.2.5 Basic Concepts of Priority queue 2.2.6 Basic Concepts of Double-ended queue	15	8	CO1, CO2, CO3, CO4
UNIT III	**3 LINKED LIST** 3.1 Introduction 3.2 Basic Concept 3.3 Implementation 3.4 Operations on a Linked List 3.4.1 Insert a node at the end of the list 3.4.2 Delete a node at the end of the list	15	8	CO1, CO2, CO3, CO4

	3.4.3 Search a node
	3.4.4 Traverse through the list
	3.5 Types of linked lists
	    3.5.1 Insert a node at the end of the list
	    3.5.2 Basic Concepts of Doubly linked lists			

UNIT IV	**4 SEARCHING AND SORTING**
	4.1 Searching Techniques
	    4.1.1 Basic concept
	    4.1.2 Linear Search
	    4.1.3 Binary Search
	4.2 Sorting Techniques
	    4.2.1 Basic Concept
	    4.2.2 Bubble Sort
	    4.2.3 Selection Sort
	    4.2.4 Insertion Sort
	    4.2.5 Quick Sort
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT V	**5 BASIC CONCEPTS OF TREES AND**
	    GRAPHS
	5.1 Trees
	    5.1.1 Basic Concept
	    5.1.2 Binary Tree
	    5.1.3 Binary Tree Representation
	    5.1.4 Binary Tree Traversal
	    5.1.5 Binary Search Tree
	5.2 Graphs
	    5.2.1 Basic Concept
	    5.2.2 Types of Graph –undirected, directed
	        graph
	    5.2.3 Graph Traversal – Depth first search,
	        Breadth first search
		15	10	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1 INTRODUCTION TO DATA STRUCTURES** 1.1 Introduction 1.2 Definition of Data Structure 1.3 Types of Data Structures 1.4 Data Structure Operations 1.5 Algorithms	10	15

	1.6 Types of Algorithms 1.7 Space and Time complexity 1.8 Asymptotic Notation		
2	**2 STACKS AND QUEUES** 2.1 Introduction 2.2 Queues	8	15
3	**3 LINKED LIST** 3.1 Introduction 3.2 Basic concept 3.3 Implementation 3.4 Operations on a Linked List 3.5 Types of linked lists	10	15
4	**4 SEARCHING AND SORTING** 4.1 Searching Techniques 4.2 Sorting Techniques	10	15
5	**5 TREES AND GRAPHS** 5.1 Trees 5.2 Graphs	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	Program to implement Arrays & Strings
2.	Program to implement Structures
3.	Program to implement pointers
4.	Programs to implement file handling
5.	Program to implement stacks
6.	Program to implement Queues
7.	Program to implement Linked List
8.	Program to implement Linear Search
9.	Program to implement Binary Search
10.	Program to implement Bubble Sort
11.	Program to implement Selection Sort
12.	Program to implement Insertion Sort

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	E. Balagurusamy	Data Structures Using C	McGraw Hill Education Pvt Ltd
2	Yeshwant Kanetkar	Data Structures Through C	BPB Publications,2003
3	ISRD Group	Data Structures Using C	Tata McGraw Hill
4	R. Krishnamurthy	Data Structures Using C	Tata McGraw Hill Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	ReemaThareja	Data Structures Using C	Oxford University Press, 2014
2	A.Tennenbaum	Data Structures Using C	Pearson Education
3	Alfred V. Aho, John E. Hopcraft, J.D. Ullman	Data Structures and Algorithms	Pearson Education

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm
2	https://www.geeksforgeeks.org/data-structures/
3	https://www.studytonight.com/data-structures/introduction-to-data-structures

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/playlist?list=PL2_aWCzGMAwI3W_JlcBbtYTwiQSsOTa6P
2	https://www.youtube.com/watch?v=8hly31xKli0
3	https://www.youtube.com/watch?v=YOfXMQnUlZY

(CM 512) E-COMMERCE

1. COURSE OBJECTIVES: In this course students will learn the concepts of E-Commerce, electronic payment systems and tools used to build an E-Commerce web site.

2.   PRE-REQUISITES: NIL

3. TEACHING AND EXAMINATION SCHEME

Semester	V	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
Course code & course title						Theory Marks		Practical Marks		
CM 512 E-commerce		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4.COURSE OUTCOMES: On successful completion of the course, the student will be able to:

CM512.CO1: Explain the different technologies in the field of e-commerce and m-commerce.CM512.CO2: Use various electronic payment systems.

CM512.CO3: Implement an e-commerce application. CM512.CO4: Manage an e-commerce enterprise

5.   MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1 Basic & Discipline Specific Knowledge	PO 2 Problem Analysis	PO 3 Design and Development of Solutions	PO 4 Engg. Tools, Experimentation & Testing	PO 5 Engg. Practices for Society, Sustainability & Environment	PO 6 Project Management	PO 7 Life -long Learning
CM512.CO1	2	1	2	1	1	2	2
CM512.CO2	2	2	2	2	2	2	2
CM512.CO3	2	2	2	2	2	2	2
CM512.CO4	2	1	1	1	1	3	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM512.CO1	1	2
CM512.CO2	2	2
CM512.CO3	3	2
CM512.CO4	2	2

6.   DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO

UNIT I	**1. INTRODUCTION TO ECOMMERCE**
	1.1 Defining Electronic Commerce
	    1.1.1 Brief History of Electronic Commerce.
	1.2 Forces Fueling Electronic Commerce
	    1.2.1 Economic Forces
	    1.2.2 Marketing and Customer Interaction Forces
	    1.2.3 Technology and Digital Convergence
	    1.2.4 Implications of Various Forces
	1.3 Electronic Commerce Industry Framework
	    1.3.1 The Information Superhighway
	    1.3.2 Multimedia Content and Network Publishing
	    1.3.3 Messaging and Information Distribution
	    1.3.4 Common Business Services Infrastructure
	1.4 Types of Electronic Commerce
	    1.4.1 Inter-organizational Ecommerce
	    1.4.2 Intra-organizational Ecommerce
	    1.4.3 Consumer to Business Ecommerce
	    1.4.4 Intermediaries and Ecommerce
			15	8	CO1,
					CO2,
					CO3,
					CO4

UNIT II	**2. ELECTRONIC PAYMENT SYSTEMS**
	2.1 Overview of the Electronic Payment Technology
	    2.1.1 The Online shopping experience
	    2.1.2 Limitation of traditional payment
	    2.1.3 Problems with traditional payment methods
	2.2 Electronic or Digital Cash
	    2.2.1 Properties of Electronic cash
	    2.2.2 Digital cash in action
	    2.2.3 Purchasing digital cash from currency servers
	    2.2.4 Using digital currency
	2.3 Electronic Checks
	    2.3.1 Benefits of Electronic checks
	    2.3.2 Electronic check in action
	2.4 Online Credit Card-Based Systems
	    2.4.1 Types of credit card payments
	    2.4.2 Payments using encrypted credit card details
	    2.4.3 Payments using third party verification
	2.5 Other Emerging Financial Instruments
			15	10	CO1,
					CO2,
					CO3,
					CO4

	2.5.1 Debit cards at point of sale (POS) 2.5.2 Debit Cards and Electronic Benefits Transfer 2.5.3 Smart cards			

UNIT III	**3. ELECTRONIC COMMERCE AND RETAILING**
	3.1 Issues in developing a business model
	3.2 Changing Retail Industry Dynamics
	    3.2.1 Overbuilding and Excess Capacity
	    3.2.2 Demographic Changes
	    3.2.3 Consumer Behavior
	    3.2.4 Technology improvements in Electronic retailing
	3.3 Mercantile Models from the Consumer's Perspective
	    3.3.1 Distinct phases of a consumer merchantile model
	    3.3.2 Types of consumers
	    3.3.3 Types of purchases
	    3.3.4 Prepurchase Preparation
	    3.3.5 Prepurchase Deliberation
	    3.3.6 Prepurchase Comparison and negotiation process
	    3.3.7 Purchase Consummation
	    3.3.8 Post purchase Interaction
	3.4 Management Challenges in Online Retailing.
	    3.4.1 Come up with retailing strategy
	    3.4.2 Manage channel conflicts
	    3.4.3 Learn to price online products/services
	    3.4.4 Deliver a satisfying shopping experience
	    3.4.5 Design the layout of an online store
	    3.4.6 Manage brands
	    3.4.7 Create the right incentives
		15	10	CO1,
				CO2,
				CO3,
				CO4

UNIT IV	**4. MARKETING STRATEGIES ON THE WEB**
	4.1 Rules for marketing strategy on the internet
	4.2 Web Design
	    4.2.1 The Power of internet
	    4.2.2 Content in King
	    4.2.3 Feedback and online survey
	    4.2.4 Frequently asked questions
	    4.2.5 Corporate design rules
	    4.2.6 Navigational aids
	    4.2.7 Color schema
	    4.2.8 File size
	4.3 Attracting visitors to site
	    4.3.1 Gaining market share through content
	    4.3.2 Offering free information
	    4.3.3 Personalization
	    4.3.4 Support online and offline reading
	4.4 Virtual Societies
		15	10	CO1,
				CO2,
				CO3,
				CO4

	4.4.1 Affiliate networks
	4.4.2 Internet communities
	4.4.3 Interactive user groups
	4.5 Promoting your E-Business
	    4.5.1 Choosing the right domain
	    4.5.2 Announcing the website
	4.6 Banners Ad Campaigning
	    4.6.1 Banner Advertising rules
	    4.6.2 Banner Exchange
	4.7 One-to –one marketing
	    4.7.1 Developing customer relationship
	    4.7.2 Customer centric marketing
	4.8 Direct marketing
	    4.8.1 Spam
	    4.8.2 Mailing list and Newsletters			

UNIT V	**5. SUPPLY CHAIN FUNDAMENTALS AND ONLINE SERVICES**
	5.1 Supply Chain Fundamentals
	    5.1.1 What is supply chain management
	    5.1.2 Pull versus Push supply chain models
	    5.1.3 Elements of supply chain: Planning systems, Execution systems, Performance measurement systems
	    5.1.4 Integrating Functions in a supply chain
	5.2 Intranets and Customer Asset Management
	    5.2.1 Challenges in Implementing Customer Asset Management
	    5.2.2 Customer Asset Management and Supply Chains
	5.3 Online Sales Force Automation
	    5.3.1 What is sales force automation
	    5.3.2 Elements of online sales automation
	    5.3.3 Intranet and sales automation
	5.4 Online Customer Service and Support
	    5.4.1 The Web and Customer Service
	    5.4.2 The Role of Technology in Customer Service.
		15	10	CO1,
				CO2,
				CO3,
				CO4

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8.   **SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN**

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO ECOMMERCE** 1.1 Defining Electronic Commerce 1.2 Forces Fuelling Electronic Commerce 1.3 Electronic Commerce Industry Framework 1.4 Types of Electronic Commerce	8	15
2	**2. ELECTRONIC PAYMENT SYSTEMS** 2.1 Overview of the Electronic Payment Technology 2.2 Electronic or Digital Cash 2.3 Electronic Checks 2.4 Online Credit Card-Based Systems 2.5 Other Emerging Financial Instruments	10	15
3	**3. ELECTRONIC COMMERCE AND RETAILING** 3. 1 Issues in developing a business model 3. 2 Changing Retail Industry Dynamics 3. 3 Mercantile Models from the Consumer's Perspective 3. 4 Management Challenges in Online Retailing.	10	15
4	**4. MARKETING STRATEGIES ON THE WEB** 4.1 Rules for marketing strategy on the internet 4.2 Web Design 4.3 Attracting visitors to site 4.4 Virtual Societies 4.5 Promoting your E-Business 4.6 Banners Ad Campaigning 4.7 One-to –one marketing 4.8 Direct marketing	10	15
5	**5. SUPPLY CHAIN FUNDAMENTALS AND ONLINE SERVICES** 5.1 Supply Chain Fundamentals 5.2 Intranets and Customer Asset Management 5.3 Online Sales Force Automation 5.4 Online Customer Service and Support	10	15
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Analysis of any E-commerce website based on following criteria a. User Interface b. Product Catalog c. Payment options d. Search options e. Security
2	Designing a Homepage for E-Commerce Site
3	Study of Electronic Payment Systems.
4	Designing Product Catalog.
5	Study of Online Promotional Strategies.
6	Study of E-commerce Enterprise(any one)
7	Case study of Payment gateway (any one)
8	Case study on an E-commerce website.

10.   LEARNING

RESOURCES Text Books

S. No.	Author	Title of Books	Publishers
1	Ravi Kalakota& Andrew B, Whinston	E-Commerce (Unit 1,2,3,5)	Pearson Education India,
2	Daniel Amor	E-Business (R) Evolution (Unit 4)	Pearson Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	KamleshAgarwala, AmitLal, DeekshaAgarwala	Business on the Net	Macmillan Publishers India Limited
2	Mukesh Chandra Trivedi	Electronic Commerce	Springer
3	Nan Si Shi	Mobile Commerce	Idea Group Publishing

Internet and Web Resources

S. No.	Description
1	https://en.wikipedia.org/wiki/E-commerce_payment_system
2	https://www.wisdomjobs.com/e-university/e-commerce-concepts-tutorial-7/retailing-in-e-commerce-11855.html
3	https://www.thebalancesmb.com/top-10-internet-marketing-strategies-2295375

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=3DyW10RWEmU
2	https://www.youtube.com/watch?v=avRkRuQsZ6M
3	https://www.youtube.com/watch?v=xKJjyn8DaAw

(CM 513) FOSS (FREE AND OPEN SOURCE SOFTWARE)

1. **COURSE OBJECTIVES:** In this course the students will be exposed to free and open source software philosophy and tools.

2. **PRE-REQUISITE:** NIL

3. **TEACHING AND EXAMINATION SCHEME**

Semester	V								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
						Theory Marks		Practical Marks		
CM 513 **FOSS (Free and Open Source Software)**		L	T	P	H	TH	TM	TW	PR/OR	
		3	-	2	5	75	25	25	25	150

4. **COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

CM513.CO1: Explain the concepts of Free and Open Source Software.

CM513.CO2: Use the concepts of Free and Open Source Software. CM513.CO3: Examine various Free and Open Source Software.

CM513.CO4: Design Free and Open Source Software.

5. **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM513.CO1	3	2	2	1	2	1	2
CM513.CO2	3	2	2	1	2	1	2
CM513.CO3	3	2	2	2	2	2	2
CM513.CO4	3	2	3	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM513.CO1	2	1
CM513.CO2	2	1
CM513.CO3	2	2
CM513.CO4	3	2

6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes		
	UNIT		**M**	**Thr**	**CO**
UNIT I	1. **INTRODUCTION TO FREE AND OPEN SOURCE SOFTWARE (FOSS)** 1.1 What is free/Open Source software? 1.2 Difference between Open source Software and Proprietary Software 1.3 Definition of Freeware, Free Software, Shareware 1.4 FOSS philosophy: Free Software Foundation, Open Source Initiative Philosophy 1.5 History of FOSS 1.6 Why FOSS? 1.7 Is FOSS free? 1.8 How large are the savings from FOSS? 1.9 Direct Cost Savings – An example 1.10 Benefits of FOSS: Security, Reliability/Stability, Open standards and vendor independence, Reduced reliance on imports, Developing local software capacity, (Piracy, IPR and WTO), Localization 1.11 Disadvantages of FOSS: Lack of business applications, Interoperability with proprietary systems, Documentation and Polish	15	9	CO1, CO2, CO3, CO4
UNIT II	2. **FOSS- LEGAL ASPECTS AND ECONOMY** 2.1 Introduction to intellectual property: Copyright, Trade secret, Patents and utility models, Registered trademarks and logos 2.2 Introduction to Free software licences 2.3 Types of licences: Permissive licences, Strong licences- The GNU General Public Licence 2.4 Distribution under several licences 2.5 Program documentation 2.6 Funding free software projects: Public funding, Private not-for-profit funding, Financing by	15	10	CO1, CO2, CO3, CO4

	someone requiring improvements, Financing as an internal investment 2.7 Business models based on free software: Better knowledge, Source of a free software product, Product source with limitations, Special licenses			
UNIT III	**3. FREE SOFTWARE ENGINEERING AND DEVELOPMENT ENVIRONMENTS & TECHNOLOGIES** 3.1 Introduction to Free software engineering 3.2 The cathedral and the bazaar 3.3 Leadership and decision-making in the bazaar 3.4 Free software processes 3.5 Criticism of "The cathedral and the bazaar" 3.6 Description of Development environments, tools and systems 3.7 Associated languages and tools 3.8 Integrated development environments 3.9 Basic collaboration mechanisms 3.10 Source management: CVS, Disadvantages of CVS 3.11 Documentation: DocBook, Wikis 3.12 Bug management and other issues 3.13 Development support sites: SourceForge	15	10	CO1, CO2, CO3, CO4
UNIT IV	**4. OPEN SOURCE DEVELOPMENT** 4.1 History of open source development 4.2 Evolution of the open source movement 4.3 Introduction to Community driven development 4.4 Developers' group-Software design and development: Hardware platform, Operating system, Automatic code generators, Version control 4.5 Builders' group: Software building 4.6 Testers' group: Software Testing 4.7 Release management group: Packaging 4.8 Release management group: Releasing 4.9 Installation 4.10 Issue tracking- Introduction, Life cycle of an issue	15	10	CO1, CO2, CO3, CO4
UNIT V	**5. CASE STUDIES OF FOSS** 5.1 Moodle - Learning Management System (LMS) 5.2 What is Moodle? 5.3 Benefits of Moodle 5.4 Basic structure of Moodle site: Front page, Inside Moodle	15	9	CO1, CO2, CO3, CO4

	5.5 OpenOffice.org: History, Organization of OpenOffice.org, Analysis of OpenOffice.org with respect to status, programming languages used 5.6 Red Hat Linux: History, Analysis of Red Hat Linux with respect to status, programming languages used 5.7 Mozilla: History, Analysis of Mozilla with respect to status, programming languages used 5.8 Apache: History, Analysis of Apache with respect to status, programming languages used 5.9 FOSS in Government - a case study: Introduction, Motivation, Implementation approach, Results 5.10 FOSS in Education - a case study: Introduction, Motivation, Implementation approach, Results		

7. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**1. INTRODUCTION TO FREE AND OPEN SOURCE SOFTWARE (FOSS)** 1.1 What is free/Open Source software? 1.2 Difference between Open source Software and Proprietary Software 1.3 Definition of Freeware, Free Software, Shareware 1.4 FOSS philosophy 1.5 History of FOSS 1.6 Why FOSS? 1.7 Is FOSS free? 1.8 How large are the savings from FOSS? 1.9 Direct Cost Savings – An example 1.10 Benefits of FOSS 1.11 Disadvantages of FOSS	9	15

2	**2. FOSS- LEGAL ASPECTS AND ECONOMY**
	  2.1 Introduction to intellectual property: Copyright, Trade secret, Patents and utility models, Registered trademarks and logos
	  2.2 Introduction to Free software licences
		10	15

	2.3 Types of licences: Permissive licences, Strong licences-The GNU General Public Licence
	  2.4 Distribution under several licences
	  2.5 Program documentation
	  2.6 Funding free software projects: Public funding, Private not-for-profit funding, Financing by someone requiring improvements, Financing as an internal investment
	  2.7 Business models based on free software: Better knowledge, Source of a free software product, Product source with limitations, Special licenses		

3	**3. FREE SOFTWARE ENGINEERING AND DEVELOPMENT ENVIRONMENTS & TECHNOLOGIES**
	  3.1 Introduction to Free software engineering
	  3.2 The cathedral and the bazaar
	  3.3 Leadership and decision-making in the bazaar
	  3.4 Free software processes
	  3.5 Criticism of "The cathedral and the bazaar"
	  3.6 Description of Development environments, tools and systems
	  3.7 Associated languages and tools
	  3.8 Integrated development environments
	  3.9 Basic collaboration mechanisms
	  3.10 Source management: CVS, Disadvantages of CVS
	  3.11 Documentation: DocBook, Wikis
	  3.12 Bug management and other issues
	  3.13 Development support sites: SourceForge
		10	15

4	**4. OPEN SOURCE DEVELOPMENT**
	  4.1 History of open source development
	  4.2 Evolution of the open source movement
	  4.3 Introduction to Community driven development
	  4.4 Developers' group-Software design and development: Hardware platform, Operating system, Automatic code generators, Version control
	  4.5 Builders' group: Software building
	  4.6 Testers' group: Software Testing
	  4.7 Release management group: Packaging
	  4.8 Release management group: Releasing
	  4.9 Installation
	  4.10 Issue tracking- Introduction, Life cycle of an issue
		10	15

5	**5. CASE STUDIES OF FOSS**	9	15
	5.1 Moodle - Learning Management System (LMS)		
	5.2 What is Moodle?		
	5.3 Benefits of Moodle		
	5.4 Basic structure of Moodle site: Front page, Inside Moodle		
	5.5 OpenOffice.org: History, Organization of OpenOffice.org, Analysis of OpenOffice.org with respect to status, programming languages used		
	5.6 Red Hat Linux: History, Analysis of Red Hat Linux with respect to status, programming languages used		
	5.7 Mozilla: History, Analysis of Mozilla with respect to status, programming languages used		
	5.8 Apache: History, Analysis of Apache with respect to status, programming languages used		
	5.9 FOSS in Government - a case study: Introduction, Motivation, Implementation approach, Results		
	5.10 FOSS in Education - a case study: Introduction, Motivation, Implementation approach, Results		
	Total	48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1	Study of Free and Open Source Software.
2	Study of different types of licenses with respect to FOSS.
3	Study of Business models based on free software.
4	Installation, configuration and study of Integrated development environments such as Netbeans, Eclipse etc.
5	Demonstrate the use of Github - a provider of Internet hosting for software development and version control
6	Installation and use of Moodle-Open source Learning Management System.
7	Installation of Linux operating system.
8	Study of basic Linux commands.
9	Linux system administration 1. Becoming super user 2. Temporarily changing user identity with su command 3. Using graphical administrative tools 4. Administrative commands 5. Administrative configuration files
10	Configuring Apache Web Server on Linux operating system.

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kenneth Wong and Phet Sayo	Free/Open Source software – a general introduction (Unit 1, 5)	United Nations Development Programme (UNDP)
2	J. Gonzalez Barahona, J. Seone Pascual, G. Robles	Introduction to Free Software (Unit 2,3,5)	Free Technology Academy
3	Rachna kapur, mario briggs, tapas saha, ulisses costa, pedro carvalho, raul f. Chong, peter kohlmann	G e t t i n g s t a r t e d w i t h open source development (Unit 4)	IBM corporation 2010

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Ellen Siever	Linux in a Nutshell	O'Reilly
2	Allen Tucker, Ralph Morelli, Chamindra de Silva	Software Development An Open Source Approach	CRC Press
3	Andy Oram and Zaheda Bhorat	Open Source in the Enterprise	O"Reilly

Internet and Web Resources

S. No.	Description
1	Philosophy of GNU URL: http://www.gnu.org/philosophy/
2	Version control system URL: http://git-scm.com/
3	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_open_source_software.htm

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=Qyb5KZC7d6s
2	https://www.youtube.com/watch?v=yzeVMecydCE
3	https://www.youtube.com/watch?v=loCLu8Iq1dQ

(CM514) EMBEDDED SYSTEMS DESIGN

1. COURSE OBJECTIVES: In this course students will learn the following Fundamentals of Microcontrollers and Embedded Systems and its design.

2. PRE-REQUISITES: Knowledge of Digital Electronics and Microprocessors.

3.   TEACHING AND EXAMINATION SCHEME:

Semester	V	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						**Theory Marks**		**Practical Marks**		**Total Marks**
CM514 Embedded Systems Design		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	-	2	5	75	25	25	25	150

4. COURSE OUTCOMES: On successful completion of the course, the students will be able to:

CM514.CO1: Explain the basic concepts of Embedded Systems and its design. CM514.CO2.

Identify the components of an Embedded system

CM514.CO3. Develop firmware for an embedded

system. CM514.CO4. Design and develop a simple

embedded system.

5.   MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CM514.CO1	3	2	1	1	1	1	2
CM514.CO2	3	2	1	1	1	1	2
CM514.CO3	3	2	3	2	2	2	2
CM514.CO4	3	2	3	2	2	2	2

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
CM514.CO1	2	2
CM514.CO2	2	2
CM514.CO3	3	2
CM514.CO4	3	2

6.   DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M=Marks	Thr= Teaching hours	CO = Course Outcomes			
	UNIT		M	Thr	CO
UNIT I	**1. INTRODUCTION TO 8051 MICROCONTROLLERS** 1.1 Difference between microcontrollers and microprocessors 1.2 Types of microcontrollers (4-bit,8-bit,16-bit &32-bit microcontrollers), 1.3 Processor architecture- Harvard and Princeton 1.4 Criteria for choosing a microcontroller for an embedded system. 1.5 Architecture of 8051 Microcontroller: 1.5.1 Introduction 1.5.2 8051 microcontroller hardware: Detailed block diagram, 8051 programming model, The Oscillator and Clock, 8051 Pin diagram 1.5.3 8051 Registers: Program Counter, Data Pointer, A and B CPU registers, Register Banks, Flag and Program Status word(PSW) 1.5.4 8051 Memory: Internal Memory, Internal RAM Organization, Stack and Stack Pointer, Special Function Registers (SFRs), Internal ROM, Basics of External Memory 1.5.5 Input/Output Pins and Ports (no circuits): Functions of Port 0, Functions of Port 1, Functions of Port 2, Functions of Port 3 1.5.6 Counters and Timers 1.5.7 Basics of interrupts.		15	10	CO1, CO2, CO3, CO4

UNIT II	**2. INSTRUCTION SET OF 8051 WITH ASSEMBLY LANGUAGE PROGRAMMING** 2.1 Addressing modes (only immediate, register and direct) 2.2 Assembly language programming: instruction set (bit and byte level) 2.3 Data transfer instructions, push and pop instructions, data exchanges. 2.4 Arithmetic instructions, Incrementing and decrementing, addition, and subtraction, multiplication, and division. (Also includes basic assembly language programming based on above instructions) 2.5 Logical instructions: AND, OR, EX-OR, NOT operations, clear and set. 2.6 Branching instructions: unconditional jumps, calls and subroutines. (No programming on above instructions) 2.7 Interfacing input devices: Matrix Keyboard. 2.8 Interfacing output devices: LED, LCD and seven-segment display	15	10	CO1, CO2, CO3, CO4

UNIT III	**3. INTRODUCTION TO EMBEDDED SYSTEM**
	
	3.1 Definition of Embedded System
	3.2 Embedded systems vs General Computing Systems
	3.3 Classification of Embedded Systems
	    3.3.1 Classification based on Generations
	    3.3.2 Classification based on Complexity and Performance
	3.4 Major Application Areas
	3.5 Purpose of Embedded Systems
	    3.5.1 Data Collection/Storage /Representation
	    3.5.2 Data Communication
	    3.5.3 Data (Signal) Processing
	    3.5.4 Monitoring
	    3.5.5 Control
	    3.5.6 Application-Specific User Interface
	3.6 Characteristics and Quality Attributes of Embedded Systems
	    3.6.1 Characteristics of an Embedded Systems: Application and Domain Specific, Reactive and Real Time, Operates in Harsh Environment, Distributed, Small size and Weight, Power Concerns
	    3.6.2 Quality Attributes of Embedded Systems: Operational Quality Attributes, Non-Operational
		15	9	CO1, CO2, CO3, CO4

	Quality Attributes 3.7 Examples of Application Specific Embedded system 3.7.1 Washing Machine 3.7.2 Automated Meter reading system			

UNIT IV	**4. TYPICAL EMBEDDED SYSTEM**
	
	4.1 Core of the Embedded System
	    4.1.1 General Purpose and Domain Specific Processors: Microprocessors, Microcontrollers, Digital Signal Processors
	    4.1.2 Application Specific Integrated Circuits (ASICs)
	    4.1.3 Programmable Logic Devices (PLDs)
	    4.1.4 Commercial off-the-shelf Components (COTS)
	4.2 Memory
	    4.2.1 ROM: MROM, PROM/OTP, EPROM, EEPROM, FLASH, NVRAM
	    4.2.2 RAM: Comparison of SRAM and DRAM
	    4.2.3 Memory Shadowing
	    4.2.4 Memory Selection for Embedded Systems
	    4.2.5 Basic concepts of Sensors and Actuators: LED, 7-segment LED Display, Optocoupler, Stepper Motor, Piezo Buzzer, Push Button Switch, Keyboard
	4.3 Communication Interface
	    4.3.1 Onboard Communication Interfaces: Inter Integrated Circuit (I2C) Bus, Serial Peripheral Interface (SPI) Bus, UART, Parallel Interface
	    4.3.2 External Communication Interfaces: RS-232 C, USB, Infrared, Wi-Fi, ZigBee
		15	10	CO1, CO2, CO3, CO4

UNIT V	**5. EMBEDDED FIRMWARE**
	
	5.1 Embedded Firmware Design Approaches
	    5.1.1 Super Loop based approach
	    5.1.2 Embedded Operating System based approach
	5.2 Embedded firmware Design Approaches and Development Languages
	    5.2.1 Assembly Language based Development
	        5.2.1.1 Basic steps in Source File to Object File translation
	        5.2.1.2 Advantages of Assembly Language based Development
	        5.2.1.3 Drawbacks of Assembly Language based Development
	    5.2.2 High Level Language based development
	        5.2.2.1 Advantages of High-Level Language based development
	        5.2.2.2 Limitations of High-Level Language
		15	9	CO1, CO2, CO3, CO4

	based development
	5.3 Other components of Embedded System
	    5.3.1 Reset Circuit
	    5.3.2 Brown-out Protection Circuit
	    5.3.3 Oscillator Unit
	    5.3.4 Real Time Clock
	    5.3.5 Watchdog Timer			

	Total	75	48	

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
I	**1. INTRODUCTION TO 8051 MICROCONTROLLER** 1.1 Difference between microcontrollers and microprocessors 1.2 Types of microcontrollers (4-bit,8-bit,16-bit &32-bit microcontrollers), 1.3 Processor architecture- Harvard and Princeton 1.4 Criteria for choosing a microcontroller for an embedded system. 1.5 Architecture of 8051 Microcontroller:	10	15
II	**2. INSTRUCTION SET OF 8051 WITH ASSEMBLY LANGUAGE PROGRAMMING** 2.1 Addressing modes (only immediate, register and direct) 2.2 Assembly language programming: instruction set (bit and byte level) 2.3 Data transfer instructions, push and pop instructions, data exchanges. 2.4 Arithmetic instructions, Incrementing and decrementing, addition, and subtraction, multiplication, and division. (Also includes basic assembly language programming based on above instructions) 2.5 Logical instructions: AND, OR, EX-OR, NOT operations, clear and set. 2.6 Branching instructions: unconditional jumps, calls and subroutines. (No programming on above instructions) 2.7 Interfacing input devices: Matrix Keyboard. 2.8 Interfacing output devices: LED, LCD and seven-segment display	10	15

III	**3. INTRODUCTION TO EMBEDDED SYSTEM**
	  3.1 Definition of Embedded System
	  3.2 Embedded systems vs General Computing Systems
	  3.3 Classification of Embedded Systems
	  3.4 Major Application Areas
	  3.5 Purpose of Embedded Systems
	  3.6 Characteristics & Quality Attributes of Embedded Systems
	  3.7 Examples of Application Specific Embedded system
		9	15

IV	**4. TYPICAL EMBEDDED SYSTEM**
	  4.1 Core of the Embedded System
	  4.2 Memory
	  4.3 Communication Interface
		10	15

V	**5. EMBEDDED FIRMWARE**
	  5.1 Embedded Firmware Design Approaches
	  5.2 Embedded firmware Design Approaches and Development Languages
	  5.3 Other components of Embedded System
		9	15

	Total	48	75

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Sr. No	Practical
1	Study of 8051 Microcontroller
2	Study of Keil compiler tool
3	Assembly language programs based on Data transfer instructions
4	Assembly language programs based on Arithmetic Instructions (Addition, Subtraction, Multiplication, Division)
5	Develop Assembly Language Programs based on Logical Instructions (And, Or etc.)
6	Develop Assembly Language Program to interface LED with 8051
7	Develop Assembly Language Programs to interface 7 segment Display with 8051
8	Study of Embedded systems terminology.
9	Study and classification of Embedded Systems on the basis of application areas.
10	Study of use of Sensors and Actuators in Embedded System.
11	Case study of Temperature sensor system and Traffic Light Controller System.
12	Mini project: Design a simple embedded system using 8051 microcontrollers

11. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kenneth J. Ayala	The 8051 Microcontroller, Architecture, Programming & applications-second edition	Penram International
2	Mohammad Ali Mazidi.	The 8051 Microcontroller and Embedded Systems	Pearson Education India
3	Shibu K. V.	Introduction to Embedded Systems	McGraw-Hill
4	Raj Kamal	Embedded Systems	TMH

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Frank Vahid, Tony Givargis, John Wiley	Embedded System Design	John Wiley and sons Inc.
2	Michael Predko	Programming and customizing the 8051 Microcontroller	McGraw Hill
3	Lyla	Embedded Systems	Pearson,2013
4	Davide. Simon	An Embedded Software Primer	Pearson Education

Internet and Web Resources

S. No.	Description
1	https://www.tutorialspoint.com/8051-microcontroller
2	https://openlabpro.com/learn/8051-microcontroller-tutorials/
3	https://www.tutorialspoint.com/embedded_systems/embedded_systems_tutorial.pdf
4	https://nptel.ac.in/downloads/108105057/

Videos and Multimedia Tutorials

S. No.	Description
1	https://www.youtube.com/watch?v=iXSXIJn_Xwc&list=PLm_MSClsnwm9hEIDpFfDnOEu-6kVnF4ug
2	https://www.youtube.com/watch?v=RdjtRpFlAnc&list=PLiQ6yyBxf5MoSZKMOqFredyH24e6sdZL4
3	https://www.youtube.com/watch?v=tj3GmD2cXHw
4	https://www.youtube.com/watch?v=ECEvUEkSSLg

AUDIT COURSE

(AC101) ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

1. COURSE OBJECTIVES:

 This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also importantin modern society with rapid technological advancements and societal disruptions. The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world- view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME

Semester	V								
Course code & course title	**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(AC101) Essence of Indian Knowledge and Tradition	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
	2	-	-	2	-	-	-	-	-

Course Content:

Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उनवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थानत्य आदद्) (iii) वेदांग (शिक्षा, कल्न, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उनाइग (धर्म सि, रीरांसा, नुराण, तकमिास)

⋎ Modern Science and Indian Knowledge System
⋎ Yoga and Holistic Health care
⋎ Case Studies.

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India- Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am

6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham, Delhi, 2016