



**Master of Engineering**  
(Two Year Full Time Degree Program)

**SYLLABUS**  
(M. Tech. Second Year)

**School of Computer Science and Engineering**  
**Shri Mata Vaishno Devi University Katra**  
(April 2018)

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<b>ABBREVIATIONS / CODES / NOMENCLATURE</b>	
<b>Course Code Convention</b>	
SCT – LSAY	Course Code for various Courses / Subjects
Example	SC: School Code
ALL 9101	T: Course Type Code (Lecture/Studio/Practical/Project etc.)
ALP 9102	L: Course Level (1, 2, 3, 4 & 5 for First, Second years ...)
ALS 9110	SA: Study Area / Sub Area
	Y: Semester Wise Course Number
CSE	School Code (SoCSE)
L	Lecture
P	Practical
E	Elective
C	Colloquium
D	Project Based
T	Training
S	Self Study
N	Non Credit
V	Special Lecture Topic
<b>Teaching Scheme Convention</b>	
L	Lecture
T	Tutorial
P	Practical
C	Course Credit
<b>Evaluation Scheme Convention</b>	
Minor	(Mid Term Exams / Tests) I & II
Major	Semester End Examination (ESE)
FFCS	Fully Flexible Credit System
CBCS	Choice Based Credit System

### Teaching & Examination Scheme

M.Tech., Semester-III, SECOND Year														
S. No.	Subject Code	Title of the Subject	Teaching & Credit Scheme						Evaluation & Examination Scheme					
			L	T	P	S	Total Periods/week	C	Minor E Duration (Hours)	Major E Duration (Hours)	Internal Marks	Minor (I+II) Marks	Major ESE Marks	Total Marks
1.	CSL7133	Research Methodology	3	0	0		8	3	1	3	10	40	50	100
2.	CSL6042	Optimization Techniques	3	0	0		8	3	1	3	10	40	50	100
3.	CSL7015	Information & Coding Theory	3	0	0		8	3	1	3	10	40	50	100
4.		Elective II	3	1	0		8	4	1	3	10	40	50	100
5.	CSD7004	Dissertation (preliminary)	0	0	8		8	4			10	30	60	100
		Open Elective-III	3	0	0			3	1					
		<b>SUB TOTAL</b>	15	1	8		40	20			50	190	260	500

M.Tech., Semester-IV SECOND Year													
S. No.	Subject Code	Title of the Subject	Teaching & Credit Scheme						Evaluation & Examination Scheme				
			L	T	P	S	Total Periods/week	C	Mid Term Evaluation	InternalMajor Evaluation	ExternalMajor Marks	Total Marks	
1.	CSD7005	Dissertation	0	0	40		8	20	10	30	60	100	
		<b>SUB TOTAL</b>	0	0	40			20	10	30	60	100	

M.Tech., Semester-II, SECOND Year (Elective Courses)														
S. No.	Subject Code	Title of the Subject	Teaching & Credit Scheme						Evaluation & Examination Scheme					
			L	T	P	S	Total Periods/week	C	Minor E Duration (Hours)	Major E Duration (Hours)	Internal Marks	Minor (I+II) Marks	Major ESE Marks	Total Marks
1.	CSE7141	Mobile & Pervasive Computing	3	1	0		8	4	1	3	10	40	50	100
2.	CSE7045	Robotics	3	1	0		8	4	1	3	10	40	50	100
3.	CSE7057	Embedded Systems	3	1	0		8	4	1	3	10	40	50	100
4.	CSE7114	Multimedia & Virtual Reality	3	1	0		8	4	1	3	10	40	50	100

CSL7133			Research Methodology				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	1 Hours	3 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. To develop understanding of the basic framework of research process.
2. To develop an understanding of various research designs and techniques.
3. To identify various sources of information for literature review and data collection.
4. To develop an understanding of the ethical dimensions of conducting applied research.
5. Appreciate the components of scholarly writing and evaluate its quality.

### UNIT I Research methodology

Research methodology: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques involved in Defining a Problem.

### UNIT 2 Research Design

Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling.

### UNIT 3 Measurement and Scaling Techniques

Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.

### UNIT 4 Methods of Data Collection and Analysis

Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of Skewness, Regression Analysis, Correlation.

### UNIT 5 Techniques of Hypotheses

Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses, Chi-square Test, Comparing Variance, As a non-parametric Test, Conversion of Chi to Phi, Caution in using Chi-square test.

### UNIT 6 Analysis of Variance and Co-variance

Analysis of Variance and Co-variance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, R-type Q Type factor Analysis, Path Analysis

### SUGGESTED BOOKS:

1. "Research Methodology", C.R. Kothari, Wiley Eastern.
2. "Formulation of Hypothesis", Wilkinson K.P, L Bhandarkar, Himalaya Publication, Bombay.
3. "Research in Education", John W Best and V. Kahn, PHI Publication.



CSL 6042			Optimization Techniques				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
2. To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
3. To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

### UNIT 1 Convex sets and functions

Convex sets and functions, constrained optimization methods: Introduction, Kuhn-Tucker conditions, convex optimization, Lagrange multipliers,

Non-linear programming: One-dimensional minimization method, search method, unconstrained and constrained optimization theory and practices.

### UNIT 2 Reliability

Reliability: Basic concepts, conditional failure rate function, Failure time distributions, Certain life models, Reliability of a system in terms of the reliability of its components, series system, Parallel system.

### UNIT 3 Dynamic Programming

Dynamic Programming: Multistage decision problems, computation procedure and case studies.

### UNIT 4 Queuing system

Fundamentals of queuing system, Poisson process, the birth and death process, special queuing methods.

### SUGGESTED BOOKS:

1. S.S Rao.. Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. Chong, E.K.P.and Zak, S. H.. An Introduction to Optimization, John Wiley & Sons, N.Y.
3. Peressimi A.L., Sullivan F.E., Vhl, J.J..Mathematics of Non-linear Programming, Springer – Verlag



CSL 7015			Information and Coding Theory				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. Understands the fundamentals of coding theory
2. Understands concept of source coding.
3. Understands channel coding theorem.

### UNIT 1 Mathematical Background and Introduction

Introduction to algebraic structures, Field extensions, Quadratic Residues, Krawtchouk Polynomials, Combinatorial Theory, Probability Theory, Shannon's Theorem, Coding Gain, Problems.

### UNIT 2 Linear and Good Codes

Block Codes, Linear codes, Hamming codes, Majority Logic decoding, Weight enumerators, The Lee Metric, Hadamard codes and generalizations, Binary Golay code, The Ternary Golay code, Constructing codes from other codes, Reed-Muller codes, Kerdock codes

### UNIT 3 Bounds on Codes and Cyclic Codes

Gilbert bound, Asymptotic Plotkin bound, Griesmer bound, The Linear Programming bound, Cyclic codes, Zeros of a Cyclic codes, The Idempotent of a cyclic codes, Other representations of a Cyclic codes.

### SUGGESTED BOOKS:

1. Introduction to Coding Theory, J. H. Van Lint

CSE 7141			Mobile & Pervasive Computing				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. The basis of Mobile and Pervasive Computing and its enabling technologies.
2. The scientific and engineering principles related to the enabling technologies.
3. Distributed computer systems architecture and organization.
4. Networking and communication systems theory and practice (inc. important issues such as security).

#### Unit 1: Introduction

Introduction to mobile computing, Adaptability in mobile computing, mechanism for adaption, support to build adaptive applications, applications of mobile computing.

#### Unit 2: Mobility Management

Registration area, location management principles and techniques, Mobile IP and their classification,

#### Unit 3: Data Dissemination

Challenges, data dissemination, Mobile data caching, cache consistency, performance and architectural issues, Mobile Cache management techniques, broadcasting invalidation report, handing disconnection, energy and bandwidth efficiency algorithms.

#### Unit 4: Adhoc Networks

Introduction to Adhoc networks, routing issues, Body, Personal, and Local Ad Hoc Wireless Networks, Multicasting Techniques in Mobile Ad Hoc Networks, Quality of Service in Mobile Ad Hoc Networks, Power-Conservative Designs in Ad Hoc Wireless Networks, Energy efficient algorithms for routing in Adhoc networks, clustering techniques, Coding for the Wireless Channel, Unicast Routing Techniques for Mobile Ad Hoc Networks, Position-Based Routing in Ad Hoc Wireless Networks.

#### Unit 5: Sensor Networks

Introduction to sensor networks, Data aggregation and data dissemination techniques in sensor networks, localization in sensor networks, Energy saving issues for Wireless Sensor, Broadcast Authentication and Key Management for Secure Sensor Networks, Embedded Operating Systems for Wireless Microsensor Nodes, Time Synchronization and Calibration in Wireless Sensor Networks, The Wireless Sensor Network MAC, Topology Construction and Maintenance in Wireless Sensor Networks.

#### Unit 6: Security in Adhoc and Sensor Networks

Basic concepts of cryptography, Key generation and management techniques, D-H algorithm, DES, Algorithms for key generation and distribution, overhead issues in key management w.r.t. mobile clients, Hashing techniques.

#### Unit 7: Mobile Middleware

Introduction to mobile middleware, adaption, agents, and service discovery.

### SUGGESTED BOOKS:

1. Sandeep K Gupta, Frank Adelstein, Golden G. Richard, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing: TMH



CSE 7045			Robotics				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. To acquire the knowledge on advanced algebraic tools for the description of motion
2. To develop the ability to analyze and design the motion for articulated systems
3. To develop an ability to use software tools for analysis and design of robotic systems.

### Unit 1: Computer vision

Introduction. The human eye and the camera. Vision as an information processing task. Homogeneous transformations. A geometrical framework for vision. 2D and 3D images interpretation. Industrial applications.

### Unit 2: Digital Image

Basics of image processing. Image acquisition. Segmentation, Binary and grey morphology operations. Thresholding. Filtering. Edge and corner detection. Features detection. Contours. Tracking edges and corners. Object detection and tracking. Image data compression, Real time Image processing.

### Unit 3: Lighting in Machine Vision

Lighting in Machine Vision. Introduction. Light used in machine vision. Basic rules and laws of light distribution. Filters. Light sources. Light techniques. Choice of illumination. Camera and Optical System. Camera technology. Analog and digital camera. Camera model. CCD and CMOS Technology. Sensor size. Intrinsic and extrinsic camera parameters. Camera calibration. Systems of lenses The thin lens. Beam converging and beam diverging lenses. General imaging equation. Aberrations. Practical aspects.

### Unit 3: Fundamental of Robot

Robotics. Introduction. Robot. Definition. Robot anatomy. Robot parts and their functions. Classification of robot and robotic systems. Laws of robotic. Co-ordinate systems. Drives and control systems, Power transmission systems. Planning for navigation. Different applications.

### Unit 4 : Robot actuator effectors

Robot actuator effectors. Types of end effectors. Types of grippers. Interface. Sensors. Touch and Tactile sensors.

Kinematics of Robot. Introduction. Definition. Open and closed kinematic mechanisms. Matrix representation. Homogeneous transformation, forward and inverse kinematics. Direct vs inverse kinematic task. Programming. Basics of Trajectory planning.

### Unit 5: Industrial applications

Quality control. Mapping and robot guidance. Motion estimation. Passive navigation and structure from motion .Autonomous systems.

### SUGGESTED BOOKS:

1. Computer Vision: Algorithms and Applications, Richard Szeliski, Ed. Springer, ISBN-10: 1848829345, ISBN-13: 978-1848829343, Publishing, 2010.
2. Handbook of Robotics, Bruno Siciliano, Ed. Springer-Verlag Berlin and Heidelberg GmbH & Co. K, ISBN-10: 354023957X, ISBN-13: 978-3540239574, Publishing, 2008.





CSE 7057			Embedded System				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. Foster ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.
2. Foster ability to write the programs for microcontroller.
3. Foster ability to understand the role of embedded systems in industry.
4. Foster ability to understand the design concept of embedded systems.

### UNIT 1 PRODUCT SPECIFICATION :

Hardware / Software partitioning – Detailed hardware and software design –Integration – Product testing Selection Processes, Microprocessor Vs Micro Controller, Performance tools Bench marking RTOS Micro Controller, Performance tools, Bench marking, RTOS availability, Tool chain availability, Other issues in selection processes.

### UNIT 2 PARTITIONING DECISION :

Hardware / Software duality – coding Hardware – ASIC revolution Managing the Risk –Co-verification – execution environment – memory organization – System startup –Hardware manipulation – memory mapped access – speed and code density.

### UNIT 3 INTERRUPT SERVICE ROUTINES

Watch dog timers – Flash Memory basic toolset – Host based debugging – Remote debugging – ROM emulators – Logic analyser – Caches – Computer optimisation –Statistical profiling

### UNIT 4 IN CIRCUIT EMULATORS

Buller proof run control – Real time trace – Hardware break points – Overlay memory – Timing constraints – Usage issues – Triggers.

### UNIT 5 TESTING

Bug tracking – reduction of risks & costs – Performance – Unit testing – Regression testing – Choosing test cases – Functional tests – Coverage tests – Testing embedded software – Performance testing – Maintenance.

### SUGGESTED BOOKS:

1. Arnold S. Berger – “Embedded System Design”, CMP books, USA 2002.
2. Sriram Iyer, “Embedded Real time System Programming”
3. ARKIN, R.C., Behaviour-based Robotics, The MIT Press, 1998.

CSE 7114			Multimedia And Virtual Reality				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration	Internal Marks	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	1 Hours	3.0 Hours	10	20	20	50	100

### COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. Graduate will demonstrate an ability to do research by designing and conducting experiments, analyze and interpret multimedia data individually as well as part of multidisciplinary teams.
2. Graduates will demonstrate an ability to design a system, component or process as per needs and specifications of the customers and society needs.
3. Graduates will demonstrate an ability to prepare short films and documentaries to showcase their knowledge of multimedia tools.

### UNIT 1 Multimedia preliminaries and applications

Multimedia preliminaries and applications: Development and use of multimedia packages; introduction to virtual reality and modeling languages. CD-ROM and the Multimedia Highway, Introduction to making multimedia - The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Motivation for multimedia usage, Frequency domain analysis, Application Domain & ODA etc. Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Window production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.

### UNIT 2 Multimedia building blocks

Multimedia – making it work – multimedia building blocks – Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text, audio, video and images etc., Working Exposure on Tools like Dream Weaver, 3D Effects, Flash Etc.

### UNIT 3 Multimedia and the Internet

Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, Designing for the WWW – Working on the web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.

### UNIT 4 Multimedia-looking towards Future

Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.

### SUGGESTED BOOKS:

1. Steve Heath, 'Multimedia and Communication Systems' Focal Press, UK.
2. Tay Vaughan, 'Multimedia: Making it Work', TMH
3. Keys, 'Multimedia Handbook', TMH



CSE 7004			Dissertation (Preliminary)				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration		Mid Term Evaluation Marks	Internal End term Evaluation Marks	External End term Evaluation Marks	Total Marks
0	0	8	4				10	30	60	100

**Course Contents:**

Research and development projects based on problems of practical and theoretical interest. Problem definition, background research, development of overall project plan. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories



CSE 7005			Dissertation				Pre Requisites			
Version R-01							Co-requisites			
L	T	S/P	C	Minor Duration	Major Duration		Mid Term Evaluation Marks	Internal End term Evaluation Marks	External End term Evaluation Marks	Total Marks
0	0	40	20				10	30	60	100

**Course Contents:**

Research and development projects based on problems of practical and theoretical interest. Problem definition, background research, development of overall project plan. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories