

# DETAILED SYLLABUS OF

# OPEN ELECTIVES

Offered by All Departments  
to

**B.Tech - Four Year Degree Course**

(Applicable for the Batches Admitted from 2019 - 2020)

**R-19**

(Choice Based Credit System)



# NEC

**NARASARAOPETA**  
**ENGINEERING COLLEGE**  
(AUTONOMOUS)

Kotappakonda Road, Yellamanda (P),  
Narasaraopet - 522 601, Guntur Dist.,  
Andhra Pradesh, INDIA.

**OPEN ELECTIVES OFFERED**  
**by**  
**ALL DEPARTMENTS**

**For**  
**B.TECH-R-19 CURRICULUM**  
**(4 Year Program)**



**NARASARAOPETA**  
**ENGINEERING COLLEGE**  

---

**(AUTONOMOUS)**

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP  
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47,  
Accredited by NBA & NAAC, RTA Approved Pollution test Centre, ISO 9001 : 2008 Certified Institution  
Phone : 08647-239905 [Website:www.nrtec.in](http://www.nrtec.in)

**List of open Electives offered by all Departments****Open Elective-I**

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	
1	Public Health Engineering	CE	19BCC4OE01	3	0	0	3
2	Geographical Information Systems	CE	19BCC4OE02	3	0	0	3
3	Micro Electro Mechanical System	EEE	19BCC4OE03	3	0	0	3
4	Energy Audit Conservation and Management	EEE	19BCC4OE04	3	0	0	3
5	RPT &3D Printing (Other than ME)	ME	19BCC4OE05	3	0	0	3
6	Operations Research	ME	19BCC4OE06	3	0	0	3
7	Principles of Signals, Systems & Communications (Other than ECE)	ECE	19BCC4OE07	3	0	0	3
8	Medical Electronics	ECE	19BCC4OE08	3	0	0	3
9	DBMS (Other Than CSE)	CSE	19BCC4OE09	3	0	0	3
10	Web Development Using Mean Stack Tech	CSE	19BCC4OE10	3	0	0	3
11	Front End UI and Frame Work	IT	19BCC4OE11	3	0	0	3
12	Front End Web Technologies	IT	19BCC4OE12	3	0	0	3
13	Financial Institutions, Markets and Services	MBA	19BCC4OE13	3	0	0	3
14	Human Resource Practices	MBA	19BCC4OE14	3	0	0	3

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19****Open Elective- II**

S.No.	Open Elective-II Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Disaster Management	CE	19BCC5OE01	3	0	0	3
2	Green Building & Sustainability	CE	19BCC5OE02	3	0	0	3
3	Non-Conventional Energy Resources	EEE	19BCC5OE03	3	0	0	3
4	Basics in Electrical and Electronics Engineering (Other than EEE)	EEE	19BCC5OE04	3	0	0	3
5	Work study	ME	19BCC5OE05	3	0	0	3
6	Mechatronics	ME	19BCC5OE06	3	0	0	3
7	Fundamentals of Image Processing (Other than ECE)	ECE	19BCC5OE07	3	0	0	3
8	Consumer Electronics	ECE	19BCC5OE08	3	0	0	3
9	Artificial Intelligence	CSE	19BCC5OE09	3	0	0	3
10	OOPS through JAVA	CSE	19BCC5OE10	3	0	0	3
11	Object Oriented Programming through C++	IT	19BCC5OE11	3	0	0	3
12	Cloud Computing	IT	19BCC5OE12	3	0	0	3
13	Digital Marketing	MBA	19BCC5OE13	3	0	0	3
14	Personal Finance Planning	MBA	19BCC5OE14	3	0	0	3

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19****Open Elective-III**

S.No.	Open Elective-III Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Solid and hazardous waste management	CE	19BCC6OE01	3	0	0	3
2	Ground Water Development and Management	CE	19BCC6OE02	3	0	0	3
3	Soft Computing	EEE	19BCC6OE03	3	0	0	3
4	Industrial Electronics	EEE	19BCC6OE04	3	0	0	3
5	Automotive Vehicles	ME	19BCC6OE05	3	0	0	3
6	Nano Technology	ME	19BCC6OE06	3	0	0	3
7	Introduction to Embedded Systems (Other than ECE)	ECE	19BCC6OE07	3	0	0	3
8	Global Positioning System(GPS)	ECE	19BCC6OE08	3	0	0	3
9	Cloud Computing	CSE	19BCC6OE09	3	0	0	3
10	Block Chain Technologies	CSE	19BCC6OE10	3	0	0	3
11	Digital Marketing	IT	19BCC6OE11	3	0	0	3
12	DevOps	IT	19BCC6OE12	3	0	0	3
13	Performance Management	MBA	19BCC6OE13	3	0	0	3
14	Services Marketing	MBA	19BCC6OE14	3	0	0	3

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19****Open Elective-IV**

S.No.	Open Elective-IV Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Water shed management	CE	19BCC7OE01	3	0	0	3
2	Modern Construction Material	CE	19BCC7OE02	3	0	0	3
3	Control System	EEE	19BCC7OE03	3	0	0	3
4	Embedded Control of Electric Drives	EEE	19BCC7OE04	3	0	0	3
5	Pneumatics & Hydraulic Automation	ME	19BCC7OE05	3	0	0	3
6	Industrial Robotics	ME	19BCC7OE06	3	0	0	3
7	Introduction to Micro Processors & Micro Controllers(Other than ECE)	ECE	19BCC7OE07	3	0	0	3
8	Automotive Electronics	ECE	19BCC7OE08	3	0	0	3
9	Cyber Security	CSE	19BCC7OE09	3	0	0	3
10	Ethical Hacking	CSE	19BCC7OE10	3	0	0	3
11	Human Computer Interaction	IT	19BCC7OE11	3	0	0	3
12	E-Commerce	IT	19BCC7OE12	3	0	0	3
13	Quality Management	MBA	19BCC7OE13	3	0	0	3
14	Logistics and Supply Chain Management	MBA	19BCC7OE14	3	0	0	3

**LIST OF OPEN ELECTIVES OFFERED BY CIVIL ENGINEERING DEPARTMENT****OPEN ELECTIVE-I**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	PUBLIC HEALTH ENGINEERING	CIVIL	19BCC4OE01	3	0	0	03
2	GEOGRAPHICAL INFORMATION SYSTEM	CIVIL	19BCC4OE02	3	0	0	03

**OPEN ELECTIVE-II**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	DISASTER MANAGEMENT	CIVIL	19BCC5OE01	3	0	0	03
2	GREEN BUILDINGS & SUSTAINABILITY	CIVIL	19BCC5OE02	3	0	0	03

**OPEN ELECTIVE-III**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	SOLID AND HAZARDOUS WASTE MANAGEMENT	CIVIL	19BCC6OE01	3	0	0	03
2	GROUND WATER DEVELOPMENT AND MANAGEMENT	CIVIL	19BCC6OE02	3	0	0	03

**OPEN ELECTIVE-IV**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	WATERSHED MANAGEMENT	CIVIL	19BCC7OE01	3	0	0	03
2	MODERN CONSTRUCTION MATERIAL	CIVIL	19BCC7OE02	3	0	0	03

---

**SYLLABUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE01	PUBLIC HEALTH ENGINEERING						

**COURSE OBJECTIVES:**

1. Understand the characteristic, collection, conveyance, disposal of refuse.
2. Understand the aspects of health full housing like ventilation and air conditioning
3. Apply & Evaluate the characteristics, transmission, and control of diseases
4. Analyze the knowledge on milk sanitation.
5. Evaluate sources, effects, prevention, and control of air and noise pollution.

**COURSE OUTCOMES:**

On completion of this course, students are able to:

1. Explain the importance of refuse for sanitation [K2]
2. Explain and Summarize the use of ventilation & air conditioning systems [K2]
3. Identify & Measure various diseases and their control measures [K3 & K5]
4. Classify different purification methods in food and milk sanitation. [K4]
5. Measure the control of air & noise pollution. [K5]

**SYLLABUS****UNIT I - REFUSE SANITATION**

Refuse - definition & terms connected with its - quality and characteristics of refuse - collection, conveyance and disposal methods - waste recycling - biogas and Gobar gas plants.

**UNIT II - VENTILATION AND AIR CONDITIONING**

Basic principles of health full housing - heating, ventilation, lighting and conditioning - definition - composition of air - airspace requirements - other effects on human occupancy - systems of ventilation - air conditioning systems.

**UNIT III - MALARIA INCIDENTAL TO ENGINEERING**

Introduction - mosquito characteristics - transmission of diseases - engineering aspect of the problem - control measures.

**UNIT IV - FOOD AND MILK SANITATION**

Foodborne diseases - bacterial treatment of kitchen utensils - bacteriological contents of milk sanitation - dairy barn sanitation - pasteurization methods - milk test.

**UNIT V - AIR AND NOISE POLLUTION CONTROL**

Pollutants and their sources - effects on human health, vegetation and climate - prevention and control of air pollution - air pollution control legislation - noise pollution - sources and effects - control measures.

**TEXT BOOKS**

- 1) Park .J.E and Park .K, “Text Book of Preventing and Social Medicine”, M/s Banarsidos - Bhanot, Jalapur, 2010.

**REFERENCES**

- 1) Salvato, “Environmental Sanitation”, John Wiley and Sons, New York 2002.
- 2) Cuniff .P.F, “Environmental Noise Pollution”, John Wiley and Sons, New York 2002.
- 3) Garg .S.K “Environmental Engineering”, Khanna Publication 2005.
- 4) Duggal .K.N, “Elements of Environmental Engineering”, S. Chand & Company Ltd. 2002.

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

OPEN ELECTIVE-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE02	GEOGRAPHICAL INFORMATION SYSTEM						

### COURSE OBJECTIVES:

- Understand the fundamentals and components of Geographic Information System and data models, data quality and data standards
- Analyse the details of spatial data structures and input, management and output processes.

### COURSE OUTCOMES:

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

1. Classify and Explain the basic concepts and components of GIS [K2]
2. Compare and Summarize usage of techniques used for storage of spatial data and data compression [K2]
3. Discover and analyse the modelling practices of data and topology used for input [K4]
4. Explain the Characteristics and concepts of spatial data accuracy, quality and data standards [K2]
5. Survey and Examine the data management and output conversion of output file formats and display [K4]

### UNIT I: FUNDAMENTALS OF GIS

Introduction to GIS – Basic spatial concepts – Coordinate Systems – GIS and Information Systems – Definitions – History of GIS – Components of a GIS – Hardware, Software, Data, People, Applications of GIS, Methods – Proprietary and open source Software – Types of data – Spatial, Attribute data types of attributes – scales/ levels of measurements. Introduction to Maps, Map and Map Scales, Types of Maps, Map and Globe.

### UNIT II: SPATIAL DATA MODELS

Database Structures – Relational, Object Oriented – Entities – data models conceptual, logical and physical models – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster vs. Vector Models- TIN and GRID data models.

### UNIT III: DATA INPUT AND TOPOLOGY

Scanner – Raster Data Input – Raster Data File Formats – Geo-referencing – Vector Data Input – Digitiser – Datum Projection and re-projection - Coordinate Transformation – Topology – Adjacency, connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data linking –Linking External Databases – GPS Data Integration

**UNIT IV: DATA QUALITY AND STANDARDS** Data quality – Basic aspects – completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability – OGC – Spatial Data Infrastructure

**UNIT V: DATA MANAGEMENT AND OUTPUT**

Import / Export – Data Management functions – Raster to Vector and Vector to Raster Conversion – Data Output – Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS distributed GIS. Global Methods of Interpolation, Local Methods of Interpolation

**TEXTBOOKS:**

1. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information Systems 4<sup>th</sup> Edition, BSP Publications
2. Kang-Tsung Chang, "Introduction to Geographic Information Systems", 2nd Edition, McGraw Hill Publishing, 2011.
3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, 2nd Edition, Pearson Education, 2007.
4. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., Geographical Information Systems: Principles, Techniques, Management and Applications, 2nd Edition, John Wiley & Sons, 2005.

**REFERENCE:**

1. Lo Albert C.P. Yeung K.W. Concepts and Techniques of Geographic Information Systems, Prentice Hall of India Publishers, 2006
2. Burrough, P. A., and McDonnell, R.A., Principles of Geographical Information Systems, 2nd Edition, Oxford University Press, 1998.
3. Demers, M. N., Fundamentals of Geographic Information Systems, John Wiley & Sons, 3rd Edition, 2002.
4. Longley, P.A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., Geographic Information Systems and Science, 2<sup>nd</sup> Edition, John Wiley and Sons, 2005.
5. Kang-Tsung Chang, "Introduction to Geographic Information Systems", McGraw-Hill Book Company, 2006.

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

OPEN ELECTIVE-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
CODE:19BCC5OE01	<b>DISASTER MANAGEMENT</b>						

### COURSE LEARNING OBJECTIVES:

The objective of this course is:

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
- Understand the relief system and the disaster victim.
- Describe the three planning strategies useful in mitigation.
- Identify the regulatory controls used in hazard management.
- Describe public awareness and economic incentive possibilities.
- Understand the tools of post-disaster management.

### COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

- Affirm the usefulness of integrating management principles in disaster mitigation work
- Distinguish between the different approaches needed to manage pre during and post- disaster periods
- Explain the process of risk management
- Relate to risk transfer

### UNIT-I

**NATURAL HAZARDS AND DISASTER MANAGEMENT:** Introduction of DM –Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action- Case study methods of the following: floods, draughts –Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

### UNIT-II

**MAN MADE DISASTER AND THEIR MANAGEMENT ALONG WITH CASE STUDY METHODS OF THE FOLLOWING:** Fire hazards – transport hazard dynamics – Civil Engineering solid waste management – post disaster – bio terrorism -threat in megacities, rail and air craft’s accidents, and Emerging infectious diseases & Aids and their management.

### UNIT-III

**RISK AND VULNERABILITY:** Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

**UNIT-IV**

**ROLE OF TECHNOLOGY IN DISASTER MANAGERMENTS:** Disaster management for infra structures, taxonomy of infra-structure – treatment plants and process facilities- roads and bridges- mitigation programme for earth quakes -multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

**UNIT-V**

**EDUCATION AND COMMUNITY PREPAREDNESS:** Education in disaster risk reduction- Essentials of school disaster education-Community capacity and disaster resilience- Community based disaster recovery -Community based disaster management and social capital- Designing resilience- building community capacity for action.

**TEXT BOOKS:**

1. Disaster Management – Global Challenges and Local Solutions ‘by Rajib shah & R Krishnamurthy (2009), Universities press.
2. Disaster Science & Management ‘by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. Disaster Management – Future Challenges and Opportunities ‘by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

**REFERENCES:**

1. Disaster Management ‘edited by H K Gupta (2003), Universities press.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:119BCC5OE02	<b>GREEN BUILDINGS &amp; SUSTAINABILITY</b>						

**Course objectives:**

- To make students to learn principles of Green buildings & sustainability
- To understand the concepts of green building council.
- To evaluate the analysis, design and site development layout.

**Course Outcomes:**

On completion of this course, students are able to

- Achieve Knowledge of Indian green building council.
- Understand the principles of Green buildings.
- Achieve the knowledge of site issues, water issues, and sustainable materials
- Understand the concepts of economics of green homes.

**UNIT – I**

**Introduction to Green Buildings:** Green Buildings, Global warming, requirement of Green Building, Benefits of Green Buildings, Requisites for Constructing a Green Building, sustainable construction focus point: site, water, Energy, material, indoor air quality, construction procedures.

**UNIT – II**

**Indian Green Building Council:** Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, procedure to get IGBC certification.

**UNIT – III**

**Green Building Design: Site Issues:** site analysis and design, site development and layout.

**Water Issues:** watershed protection, drainage of concentrated Runoff, water efficiency and Conservation, rain water harvesting, water reclamation. **Sustainable Materials:** Reduce / Reuse / Recycle, Natural Sources, concrete, masonry, metals, Wood and plastic, finishes

**UNIT – IV**

**Passive Solar Design:** Passive solar design, Day lighting, Building envelope, Renewable energy, **Construction Process and Maintenance of Green Building:** Environmental construction Guidelines, building operations and maintenance.

**UNIT – V**

**Indoor Environmental Quality:** Significance, design principle, ventilation control, occupant activity control, significance of Acoustics. **Economics of Green Homes:** Economics of green buildings, Selecting environmentally and economically balanced building materials, Project cost, Income and expenses.

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

### **TEXT BOOKS:**

1. Sustainable building technical manual- Green building design, constructions and operation; Produced by Public Technology Inc., US Green Building Council.
2. Green homes by R.K .Gautama, BS publications.
3. IGBC Green homes rating system Version 1.0 – A bridged reference guide.

### **REFERENCES:**

1. Green Building A Basic Guide to Building and Remodelling Sustainably; Tree Hugger Consulting.
2. Green Building Handbook, Volume 1, Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison; E & FN Spon, an imprint of Thomson Science & Professional

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
<b>OPEN ELECTIVE-III</b>	3	-	0	40	60	100	3
CODE: 19BCC6OE01	<b>SOLID AND HAZARDOUS WASTE MANAGEMENT</b>						

### **COURSE OBJECTIVES:**

- To know about Sources, types, Composition of MSW
- To learn how to handle, separate and store the solid waste at source of collection
- To know the method of transfer and transport the solid waste after the collection from the source.
- To learn how to separate, and transformation methods like Pyrolysis, composting, Incineration, etc. Materials to be recycled from MSW

### **COURSE OUTCOMES:**

After the exposure to the subject, student is able to:

- Compared Solid Waste Management program success in a city or town.
- Exposure the different techniques of SWM
- Assess different process techniques of solid waste
- Classify different types of waste.
- Analyse existing scenario of solid waste management in India

### **UNIT – I**

#### **SOURCES, TYPES AND COMPOSITION OF MUNICIPAL SOLID WASTE**

Sources- Types- Composition of Solid Waste- Effects of improper disposal of solid waste- public health effects-Types of materials recovered from MSW-Biological waste. **WASTE HANDLING AND STORAGE** On- site handling and separation at solid waste-on - site storage of solid waste-options under Indian conditions.

### **UNIT-II**

#### **COLLECTION OF MUNICIPAL SOLID WASTE**

Methods of collection-equipment- types of vehicles-man power requirement-collection routes. **TRANSFER AND TRANSPORT OF MUNICIPAL SOLID WASTE** Need for Transfer operations-Transfer Stations-Selection of Location of Transfer Station-Transport means and methods.

### **UNIT-III**

**PROCESSING TECHNIQUES** Mechanical volume reduction-Thermal volume reduction- manual component separation. **DISPOSAL OF SOLID WASTE** Disposal of Solid Waste – Sanitary land Fills- Site selection- Planning-Design and operation of Sanitary landfills- Leachate collection & treatment-composition of land fill gases.

### **UNIT- IV**

**SEPARATION AND TRANSFORMATION OF SOLID WASTE:** unit operations

Used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization. **RECOVERY OF THERMAL AND**

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**BIOLOGICAL CONVERSION:** Combustion of waste materials-incineration with heat recovery-gasification-pyrolysis **RECOVERY OF BIOLOGICAL CONVERSION:** Composting- Anaerobic digestion

### **UNIT-V**

**PLASTIC WASTE MANAGEMENT:** Dangers of Plastics- Types- pyrolysis- Recycling of Plastic waste-Disposal of plastic waste. **E-WASTE MANAGEMENT** Health Hazards of E- waste-sources-components-collection-segregation-E- waste management. Case studies.

### **TEXT BOOKS:**

1. Integrated Solid waste management by George Tchobanolous, Hilary Theisen & Samuel A. Vigil. McGraw Hill International Editions.
2. Design of Land Fills and Integrated Solid waste management by Amalendu Bagchi , John Wiley & Sons.
3. Solid and Hazardous waste management by M.N.Rao, Butterworth-Heinemann.

### **REFERENCE BOOKS:**

1. CPCB Manual on solid waste Management
2. Solid waste management K.sasikumar, sanoop Gopi Krishna PHI Learning (P) Ltd.
3. Solid waste management in India by Urvashi Dhamija.

### **E-LEARNING RESOURCES:**

NPTEL

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

OPEN ELECTIVE - III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	--	--	40	60	100	3
CODE:19BCC6OE02	<b>GROUND WATER DEVELOPMENT AND MANAGEMENT</b>						

### **Course Learning Objectives:**

The course is designed to

- Appreciate groundwater as an important natural resource.
- Understand flow towards wells in confined and unconfined aquifers.
- Understand the principals involved in design and construction of wells.
- Create awareness on improving the groundwater potential using various recharge techniques.
- Know the importance of saline water intrusion in coastal aquifers and its control measures.
- Appreciate various geophysical approaches for groundwater exploration.
- Learn groundwater management using advanced tools.

### **Course Outcomes:**

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

- Estimate aquifer parameters and yield of wells.
- Analyse radial flow towards wells in confined and unconfined aquifers.
- Design wells and understand the construction practices.
- Interpret geophysical exploration data for scientific source finding of aquifers.
- Determine the process of artificial recharge for increasing groundwater potential.
- Take effective measures for controlling saline water intrusion.
- Apply appropriate measures for groundwater management.

### **UNIT – I**

Introduction Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation. Well Hydraulics Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers.

### **UNIT – II**

Well Design Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

### **UNIT III**

Well Construction and Development Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

### **UNIT IV**

Artificial Recharge Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge. Saline Water Intrusion Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of saline water intrusion.

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

### **UNIT – V**

Geophysics Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

### **TEXT BOOKS**

- ‘Groundwater’ by Raghunath H M, New Age International Publishers, 2005.
- ‘Groundwater Hydrology’ by Todd D.K., Wiley India Pvt Ltd., 2014.
- ‘Groundwater Hydrology’ by Todd D K and L W Mays, CBS Publications, 2005.

### **REFERENCES**

- ‘Groundwater Assessment and Management’ by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
- ‘Groundwater Hydrology’ by Bouwer H, McGraw Hill Book Company, 1978.
- ‘Groundwater Systems Planning and Management’ by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
- ‘Groundwater Resources Evaluation’ by Walton W C, Mc Graw Hill Book Company, 1978.

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

OPEN ELECTIVE-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	--	0	40	60	100	3
CODE:19BCC7OE01	<b>WATERSHED MANAGEMENT</b>						

**COURSE OBJECTIVES:**

- To develop watershed management program making proper use of all available resources.
- To obtain optimum output from watershed with minimum hazards to natural resources.

**COURSE OUTCOMES:**

- Understand the different components of watershed.
- Plan for developing watershed management in a needy area.
- Plan for integrating the conservation aspects such as water harvesting, land management, and ecosystem management for developing an integrated watershed with minimum disturbance to the natural resources.

**UNIT - I**

**INTRODUCTION:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

**UNIT-II**

**CHARACTERISTICS OF WATERSHED:** size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socioeconomic characteristics, basic data on watersheds.

**UNIT – III**

**PRINCIPLES OF EROSION:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

**MEASURES TO CONTROL EROSION:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

**UNIT - IV**

**WATER HARVESTING:** Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

**UNIT - V**

**LAND MANAGEMENT:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils, Applications of Remote Sensing and Geographical Information System in Watershed management

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

### **TEXT BOOKS**

1. JVS Murthy, Watershed Management - New Age International Publishers revised edition -1998
2. R.Awurbs and WP James, Water Resource Engineering - revised edition Prentice Hall Publishers2001.

### **REFERENCES**

2. VVN Murthy, Land and Water Management, revised edition- Kalyani Publications-ss2015.
3. D.K.Majumdar, Irrigation and Water Management revised edition Prentice Hall of India2001.

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

OPEN ELECTIVE-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	--	0	40	60	100	3
CODE:19BCC7OE02	<b>MODERN CONSTRUCTION MATERIAL</b>						

**OBJECTIVES:**

To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials.

**OUTCOME:**

On completion of this course the students will have the knowledge of modern construction materials to be used in the field.

**UNIT I**

**SPECIAL CONCRETES:** Concretes, Behaviour of concretes – Properties and Advantages of High Strength and High Performance Concrete – Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.

**UNIT II**

**METALS:** Types of Steels – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

**UNIT III**

**COMPOSITES:** Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.

**UNIT IV**

**OTHER MATERIALS:** Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.

**UNIT V**

**SMART AND INTELLIGENT MATERIALS:** Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.

**TEXTBOOKS:**

1. Santha Kumar. A.R., Concrete Technology, Oxford University press, New Delhi, 2005.
2. Ganapathy, C., Modern Construction Materials, Eswar Press, 2015.

**REFERENCES:**

1. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.
2. Aitkens, High Performance Concrete, McGraw Hill, 1999
3. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An introduction to Properties, applications and designs”, Elsevier Publications, 2005.
4. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for civil and Highway Engineers, Prentice Hall Inc., 1998.
5. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
6. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001 9. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005.

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

---

### LIST OF OPEN ELECTIVES OFFERED BY ELECTRICAL & ELECTRONICS ENGINEERING DEPARTMENT

#### OPEN ELECTIVE-I

S.No.	Subject Title	Department	Sub Code	No. of periods per week			No. of Credits
				L	T	P	
1	Micro Electro Mechanical System	EEE	19BCC4OE03	3	0	0	3
2	Energy Audit Conservation and Management	EEE	19BCC4OE04	3	0	0	3

#### OPEN ELECTIVE-II

S.No.	Subject Title	Department	Sub Code	No. of periods per week			No. of Credits
				L	T	P	
1	Non-Conventional Energy Resources	EEE	19BCC5OE03	3	0	0	3
2	Basics in Electrical and Electronics Engineering (Other than EEE)	EEE	19BCC5OE04	3	0	0	3

#### OPEN ELECTIVE-III

S.No.	Subject Title	Department	Sub Code	No. of periods per week			No. of Credits
				L	T	P	
1	Soft Computing	EEE	19BCC6OE03	3	0	0	3
2	Industrial Electronics	EEE	19BCC6OE04	3	0	0	3

#### Open Elective-IV

S.No.	Subject Title	Department	Sub Code	No. of periods per week			No. of Credits
				L	T	P	
1	Control System	EEE	19BCC7OE03	3	0	0	3
2	Embedded Control of Electric Drives	EEE	19BCC7OE04	3	0	0	3

Open Elective-1	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BCC4OE03	<b>MICRO ELECTRO MECHANICAL SYSTEM</b>						

**Course Objectives:**

1. To provide knowledge of Micro Electro Mechanical Systems (MEMS).
2. To impart various sensors and actuators used in MEMS.
3. To educate the principle and various devices of MOEMS, Fluidic.
4. To educate the concepts of bio and chemical systems and devices.

**Course Outcomes:**

After completion of this course, Students will be able to

1. Apply thermal sensors and actuators for MEMS fabrication process.
2. Model various devices of MOEMS, Micro Fluidic systems.
3. Utilize the magnetic sensors and actuators in interdisciplinary studies
4. Explain the micro fluidic systems process.
5. Interpret the various sensor mechanism in chemical and bio-medical system.

**UNIT-I: Introduction & Thermal Sensors and Actuators**

Definition of MEMS, MEMS history and development, micro machining, Principles of sensing and actuation: piezo electric, strain, pressure, flow, MEMS gyroscopes, Thermal energy basics and heat transfer processes, thermo devices, thermal flow sensors, micro hot plate gas sensors, micro spring thermal actuator, data storage cantilever.

**UNIT-II: Micro-Opto-Electro Mechanical Systems**

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

**UNIT-III Magnetic Sensors and Actuators**

Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on Hall Effect, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, bidirectional micro actuator, and feedback circuit integrated magnetic actuator.

**UNIT-IV: Micro Fluidic Systems**

Applications, considerations on micro scale fluid, fluid actuation methods, electro wetting, and electro thermal flow. Radio Frequency MEMS: RF - based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, MEMS switches, phase shifter.

**UNIT-V: Chemical and Bio Medical Micro Systems**

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors, chemo transistors, electronic nose (E-nose), mass sensitive chemo sensors, fluorescence detection, calorimetric.

**Text Books:**

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

**Reference Books:**

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

**Web References:**

1. [https://en.wikipedia.org/wiki/Microelectromechanical\\_systems](https://en.wikipedia.org/wiki/Microelectromechanical_systems)
2. <https://www.mems-exchange.org/MEMS/what-is.html>

Open Elective- I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BCC4OE04	<b>ENERGY AUDIT CONSERVATION AND MANAGEMENT</b>						

**Course Objectives:**

1. To introduce the basic concepts of Energy Auditing and Management.
2. To familiarize the various Techniques of Electrical Energy Conservation.

**Course Outcomes:**

After successful completion of this course, the students will be able to:

3. Explain the Process of Energy Audit of Industries.
4. Apply the concepts of Energy management for Efficient Energy Utilization and Conservation.
5. Identify a suitable method for Energy Conservation of various electric devices.
6. Acquire knowledge on Lighting and Energy Instruments
7. Analyse the benefits of energy conservation from the Economic aspects.

**UNIT - I: Basic Principles of Energy Audit**

Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

**UNIT - II: Energy Management**

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

**UNIT - III: Energy Efficient Motors**

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS voltage variation- voltage unbalance- over motoring- motor energy audit.

**UNIT - IV: Lighting and Energy Instruments**

Good lighting system design and practice- lighting control -lighting energy audit – Energy. Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

**UNIT - V: Economic Aspects and Analysis**

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors- calculation of simple payback method, net present worth method Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

**Text Books**

1. Energy management by W.R. Murphy AND G. McKay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company- 1st edition, 1998

**Reference Books**

1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd2nd Edition, 1995.
2. Energy management hand book by W.C.Turner, John wiley and sons.
3. Energy management and good lighting practice: fuel efficiency- booklet12EEO.

**Web References**

1. <https://www.youtube.com/watch?v=6vOg-u7c1IE>
2. [https://en.wikipedia.org/wiki/Economic\\_impact\\_analysis](https://en.wikipedia.org/wiki/Economic_impact_analysis)

Open Elective-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	20	30	50	3
19BCC5OE03	<b>NON-CONVENTIONAL ENERGY RESOURCES</b>						

**Course Objectives:**

1. To study the solar radiation data, radiation on earth's surface and its applications.
2. To study wind energy conversion and Bio-mass generation.
3. To study basic principle and working of Geothermal, Tidal, Ocean & Wave energy Generation.
4. To study basic principle and working of Thermal Electric Power.
5. To study the working of MHD Power Generation.

**Course Outcomes:**

After completion of this course, Students will be able to

1. Illustrate the principles of solar radiation and their applications.
2. Analyse the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
3. Summarize the working principles of geothermal, ocean, tidal and wave energy techniques.
4. Interpret the functioning of Thermal Electric Power.
5. Analyse the MHD power generation and its future prospects

**UNIT – I: Introduction & Solar Energy**

Introduction to Energy Sources and their availability- renewable sources-The solar constant-Solar Radiation at the Earth's surface-instruments for measuring solar radiation - solar radiation on tilted surfaces-solar ponds-Applications of Solar ponds- solar heating- Photovoltaic energy conversion.

**UNIT – II: Wind Energy and Bio-Mass**

Principles of wind energy conversion, Components of WECS- horizontal and vertical axis windmills- performance characteristics. Bio fuels- Methods for obtaining energy from Biomass- Thermal gasification of Biomass.

**UNIT – III: Geothermal Energy, Ocean Energy, Tidal and Wave Energy**

Introduction of Geothermal Energy- Nature of Geothermal fields- Geothermal Sources- OTEC- Methods of ocean thermal electric power generation- Open cycle and closed cycle- Principle of Tidal power- Components of Tidal power plants- Advantages and Disadvantages of Wave energy- Energy and power from the Waves.

**UNIT – IV: Thermal Electric Power**

Introduction- Thermo electric power generation- See-beck, Peltier, Thomson effects - Thermo electric power generation- Thermo electric materials- Selection of materials.

**UNIT – V: MHD Power Generation**

Introduction- Principle of MHD power generation- MHD Systems- Open cycle and closed cycle Systems- Advantages of MHD Systems- International Status of MHD power generation and its future prospects.

**Text Books:**

1. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons
2. Tiwari and Ghosal, “Renewable energy resources”, Narosa.

**Reference Books:**

1. Twidell & Weir, “Renewable Energy Sources“
2. Sukhatme, “Solar Energy”, Tata McGraw-Hill Education.
3. B.S Magal Frank Kreith & J.F Kreith, “Solar Power Engineering“
4. Frank Kreith & John F Kreider, “Principles of Solar Energy”

Open Elective-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	20	30	50	3
19BCC5OE04	<b>Basics in Electrical and Electronics Engineering (Other than EEE)</b>						

**Course Objectives:**

1. To familiarize the basic DC networks used in electrical circuits.
2. To explain the concepts of electrical machines and their characteristics.
3. To identify the importance of transformers in transmission and distribution of electric power.
4. To impart the knowledge about the characteristics, working principles and applications of Semiconductor diodes, Operational Amplifier.
5. To expose basic concepts and applications of Transistor.

**Course Outcomes:**

Upon successful completion of the course, the students will be able to

1. Analyse the behaviour of an electrical circuit.
2. Measure the performance quantities such as losses, efficiency of DC machines.
3. Create the construct of transformer and Induction motor.
4. Classify the importance and applications of p-n junction diode and OP-AMPS.
5. Evaluate the configurations and applications of Transistor.

**UNIT-I: Basic laws and Circuits**

Types of network elements - Ohms law - Kirchoff's Laws - series and parallel circuits - Delta - Wye conversion - Mesh analysis - Nodal analysis with simple problem.

**UNIT-II: DC Machines**

Constructional features - Principle Operation - Induced EMF equation - Working of DC motor - Torque expression and different types of excitation - 3-point starter - losses and efficiency - Performance characteristics by direct loading.

**UNIT-III: AC Machines**

**Transformers:** Principle Operation - EMF equation - Voltage regulation - Losses and efficiency - Open/short - Circuit tests - **Three Phase Induction Motors:** Working principle of three phase induction motor - Torque equation and Torque - Slip characteristics.

**UNIT - IV: Rectifiers and OP AMPS**

P-N Junction diode - Rectifier circuits (half-wave, full-wave, rectifier) - characteristics of operational amplifier-Applications of OP-AMPS (Inverting, Non inverting, integrator and Differentiator).

**UNIT - V: Transistor Configurations**

Construction – Working - Transistor as amplifier - Transistor as switch - Analysis of CE, CB and CC Characteristic's - Comparison of CE - CB and CC configurations.

**Text Books:**

1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st edition, McGraw Hill Education (India) Private Limited, 2017.
2. Electronic Devices and Circuits, R.L.Boylestad and Louis Nashelsy, 9<sup>th</sup> edition, PEI/PHI 2006.
3. B.L.Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S.Chand Publishing, New Delhi, 2006.

**Reference Books:**

1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2/e, Pearson Education, 2008.

**Web References:**

1. URL: <https://www.youtube.com/watch?v=ohhdNRtDpCY>
2. <http://202.53.81.118/course/view.php?id=122>

**E-Books:**

1. <https://www3.nd.edu/~cpoellab/teaching/eee40814/Lecture1-Handouts.pdf>
2. <https://nptel.ac.in/courses/108105112/>

Open Elective-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BCC6OE03	SOFT COMPUTING						

**Course Objectives:**

1. To study various methods of AI, models and architecture of artificial neural networks.
2. To study the ANN paradigms.
3. To study the fuzzy sets operations and the fuzzy logic systems.
4. To study the applications of AI.

**Course Outcomes:**

After completion of this course student will be able to

1. **Understand** the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network.
2. **Analyse** and **Design** a back propagation networks and algorithm.
3. **Apply** the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers- Operations on Fuzzy Numbers, Fuzzy Relations and explain the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic.
4. **Design** and **Analyse** the Genetic algorithms and evolutionary computation, Applications of Genetic Algorithms.
5. **Explain** the applications of soft computing techniques in Electrical Engineering.

**UNIT-I: Artificial Intelligent Systems**

Artificial Intelligent systems – Neural Networks, Fuzzy Logic - Artificial Neural Networks – Biological neural networks – Model of an artificial neuron - Comparison between biological neuron and artificial neuron – Basic models of artificial neural network – Learning methods – Activation function and Terminologies of ANN - Mc Culloch Pitts Neuron – Perceptron Networks.

**UNIT-II: Back Propagation Networks**

Back propagation Networks : Architecture - Multi layer perceptron – Back propagation Learning – Input layer - Hidden Layer - Output Layer computations - Calculation of error - Training of ANN - Back propagation Algorithm - Selection of various parameters in BP networks.

**UNIT-III: Classical and Fuzzy Sets**

Fuzzy verses crisp sets – Crisp sets – Operations and properties of crisp sets - Partition and covering - Fuzzy sets - Membership function – Operation and properties of fuzzy sets - Crisp relations - Fuzzy Logic System Components - Fuzzy rule base system – Defuzzification - Types of Defuzzification - Fuzzy logic controller - Components of FLC.

**UNIT–IV: Genetic Algorithms**

Genetic Algorithms - Basic Concepts - Creation of off – springs - Working Principle – Encoding - Fitness function - Reproduction- Roulette - Wheel Selection, Boltzmann Selection - Tournament selection - Rank Selection - Cross Over - Inversion and deletion - Mutation Operator - Bitwise operators.

**UNIT–V: Applications to Electrical Engineering**

Speed control of D.C and A.C motors - Reactive Power Control - Load Frequency Control - Economic load dispatch - load flow studies - Load forecasting.

**Text books:**

1. S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd. [Module I& III].
2. R.Rajasekharan and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications, Prentice Hall of India. [Module II, & IV].

**Reference books:**

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. S. Haykins, Neural Networks – A Comprehensive Foundation, Prentice Hall 2002.
3. L. Fausett, Fundamentals of Neural Networks, Prentice Hall 1994.
4. T.Ross, Fuzzy Logic with Engineering Applications, Tata McGraw-Hill, New Delhi 1995.
5. D.E. Goldberg, Genetic Algorithms in search, Optimization and Machine Learning, Addison Wesley MA, 1989.
6. John Yen, Reza Lengari, Fuzzy Logic- Intelligence, Control and Information, Pearson Education.

Open Elective-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BCC6OE04	INDUSTRIAL ELECTRONICS						

**Course Objectives:**

1. To study the concepts of semiconductor material and semiconductor device.
2. To study the characteristics of various power semiconductor devices.
3. To understand the concept of Transducers and Ultrasonic.
4. To acquaint with the different types of heating and welding techniques.
5. To understand the concept of Programmable logic controllers.

**Course Outcomes:**

After completion of this course student will be able to

1. Explain the structures of semiconductors.
2. Explain the characteristics of various power semiconductor devices.
3. Explain the operation of different transducers and Ultrasonic.
4. Identify most appropriate heating or welding techniques for suitable applications.
5. Draw the ladder diagrams for different operations.

**UNIT-I: Semiconductor Physics**

Introduction - Semiconductor Material - Band Structure-Charge Carriers - Intrinsic and Extrinsic Semiconductors - Semiconductor Devices - Mobility.

**UNIT-II: Power Electronic Devices**

Types of Power Semiconductor devices - Uncontrolled Devices, Controlled Devices & Partially controlled devices with Examples – V-I characteristics of SCR-Process of Commutation.

**UNIT-III: Transducers & Ultrasonic**

Classification of Transducers - Strain Gauge - Variable Resistance Transducer, Capacitive – Inductive - Piezoelectric-LVDT- Thermocouples-Transducer Applications - Accelerometers, Tachogenerators, Servomotors Ultrasonic Generation – Pulsed Echo Ultrasonic Flaw Detector.

**UNIT-IV: Industrial Heating and Welding**

Resistance Heating - Induction heating - Dielectric heating - Resistance welding - Arc welding - Comparison between AC and DC Welding - Applications.

**UNIT-V: PLC**

Programmable logic controllers - Input output devices - Number systems - I/O Processing - Ladder and functional block Diagram - Architecture of PLC - Memory organization in PLC.

**Text books:**

1. Industrial electronics and control by S K Bhattacharya and S Chatterjee, Tata Mc Graw - Hill Company Ltd.
2. Power Electronics by P.C.Sen.

**Reference Books:**

1. Utilization of Electric Energy – by G.C Garg, Khanna publications
2. Longman.User manuals of PLCs, SCADA.

Open Elective-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BCC7OE03	<b>CONTROL SYSTEM</b>						

**Course Objectives:**

1. To give a basic idea about analysis of linear control systems.
2. To emphasize the student about stability analysis of a system.
3. To learn how to improve the performance of an existing system.
4. Enable an engineer to explore time domain and frequency domain tools to design and study linear control systems.
5. Enable an engineer to explore the State Space Analysis.

**Course Outcomes:**

After completion of this course student will be able to

1. Represent a system in different models.
2. Recognize and analyse feedback control mechanisms.
3. Analyse the stability of a system based on transfer function.
4. Analyse a linear control system using various time and frequency domain tools.
5. Analyse the stability of a system using State Space Analysis.

**UNIT–I: Introduction to Control Systems**

Classification of control systems – examples - Feedback Characteristics - Mathematical models – electrical - Translational and rotational mechanical systems - Transfer Function Representation: Block diagram representation of systems - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason’s gain formula.

**UNIT–II Time Domain Analysis:**

Standard test signals - Time response of first order systems – Characteristic equation of feedback control systems - Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants - Compensators and Controllers: lead, lag and lead-lag compensators, Effects of proportional derivative (PD) - Proportional integral (PI) systems - Proportional Integral and Derivative (PID) Controllers.

**UNIT–III: Stability Analysis in S-Domain:**

The concept of stability – Routh’s stability criterion – qualitative stability and conditional stability – limitations of Routh’s stability. Root Locus Technique: The root locus concept - construction of root loci - effects of adding poles and zeros to open loop transfer function on the root loci.

**UNIT–IV: Frequency Response Analysis:**

Introduction - Frequency domain specifications - Bode diagrams- Determination of Frequency domain specifications and transfer function from the Bode Diagram - Phase margin and Gain margin-Stability Analysis from Bode Plots - Stability Analysis in Frequency Domain: Polar Plots - Nyquist Plots Stability Analysis.

**UNIT–V: State Space Analysis:**

State Space Analysis of Continuous Systems Concepts of state - State variables and state model - Derivation of state models from block diagrams – Diagonalization - Solving the Time invariant state Equations - State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

**Text books:**

1. Control Systems Engineering – I. J.Nagrath and M.Gopal, New Age International (P) Limited, Pub. 2<sup>nd</sup> edition, 2005.
2. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> ed., 1998.

**Reference books:**

1. Automatic Control Systems 8th edition–B. C. Kuo – John wiley and son's 2003.
2. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup>ed., 1998.
3. Control Systems Engg. , Nise– John wiley , 3<sup>rd</sup> Edition 2000.

Open Elective-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BCC7OE04	<b>EMBEDDED CONTROL OF ELECTRIC DRIVES</b>						

**Course Objectives:**

1. To understand the basic of MC68HC11 microcontroller.
2. To know the basic of various peripherals connected to MC68HC11.
3. To study the basic of PIC16C7X microcontroller.
4. To study the basic of various peripherals connected to PIC16C7X.
5. To know basic of designing a microcontroller based system.

**Course Outcomes:**

After completion of this course student will be able to

1. Illustrate the architecture, instruction set, various peripherals of MC68HC11.
2. Analyse MC68HC11 for simple arithmetic operation and comparing.
3. Develop the architecture, instruction set, various peripherals of PIC16C7X.
4. Model PIC16C7X for simple arithmetic operation.
5. Design a microcontroller based system.

**UNIT-I: MC68HC11 Microcontroller**

Architecture memory organization - addressing modes - instruction set - programming techniques - simple programs

**UNIT-II: Peripherals of MC68HC11**

I/O ports - handshaking techniques - reset and interrupts - serial communication interface - serial peripheral interface - programmable timer - analog / digital interfacing - cache memory.

**UNIT-III: PIC 16C7X Microcontroller**

Architecture - memory organization - addressing modes - instruction set - programming techniques - simple operation.

**UNIT-IV: Peripheral of PIC 16C7X Microcontroller**

Timers - interrupts - I/O ports - I2C bus for peripheral chip access - A/D converter – UART.

**UNIT-V: System Design Using Microcontrollers**

Interfacing LCD display - Keypad interfacing - AC load control - PID control of DC motor - stepper motor control - brush less DC motor control.

**Text books:**

1. John B.Peatman, 'Design with PIC Microcontrollers, 'Pearson Education, Asia 2004.

**Reference books:**

1. Michael Khevi, 'The M68HC11 Microcontroller Applications in control, Instrumentation and communication', Prentice Hall, New Jersey, 1997.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**LIST OF OPEN ELECTIVES OFFERED BY MECHANICAL ENGINEERING DEPARTMENT****Open Elective-I**

S.No.	Subject Title	Department	Sub Code	No. of periods per week		No. of Credits
				L	T	C
1	RPT & 3D Printing (Other than ME)	ME	19BCC4OE05	3	-	3
2	Operations Research	ME	19BCC4OE06	3	-	3

**Open Elective-II**

S.No.	Subject Title	Department	Sub Code	No. of periods per week		No. of Credits
				L	T	C
1	Work study	ME	19BCC5OE05	3	-	3
2	Mechatronics	ME	19BCC5OE06	3	-	3

**Open Elective-III**

S.No.	Subject Title	Department	Sub Code	No. of periods per week		No. of Credits
				L	T	C
1	Automotive Vehicles	ME	19BCC6OE05	3	-	3
2	Nano Technology	ME	19BCC6OE06	3	-	3

**Open Elective-IV**

S.No.	Subject Title	Department	Sub Code	No. of periods per week		No. of Credits
				L	T	C
1	Pneumatics & Hydraulic Automation	ME	19BCC7OE05	3	-	3
2	Industrial Robotics	ME	19BCC7OE06	3	-	3

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
Code: 19BCC4OE05	<b>RAPID PROTOTYPING AND 3D PRINTING (Other than MECH)</b>						

**COURSE OBJECTIVES:**

- The course aims at the importance of Rapid Prototyping, classifications, models, specifications of various Rapid Prototype Techniques.
- To learn the different tools, soft-wares required and the applications of Rapid Prototyping.
- To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies

**COURSE OUTCOMES:**

**After successful completion of this course, the students will be able to:**

- CO 1:** Identify the use of Rapid Prototyping Techniques in the manufacturing of complex Components.
- CO 2:** Classify the Stereo lithography Apparatus and its process.
- CO 3:** Illustrate the process of laminated object manufacturing and fused Deposition Modeling.
- CO 4:** Explain the Selective laser sintering process.
- CO 5:** Compare different method and discuss the effects of the Additive Manufacturing Technologies.

**UNIT – I:**

**INTRODUCTION:** Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

**UNIT–II:**

**LIQUID-BASED RAPID PROTOTYPING SYSTEMS:** Stereo lithography Apparatus (SLA): models and specifications, process, working principle, layering technology, applications, advantages and disadvantages.

**UNIT–III:**

**SOLID-BASED RAPID PROTOTYPING SYSTEMS:** Laminated object manufacturing (LOM) – models and specifications, process, working principle, applications, advantages and disadvantages, Fused deposition modeling (FDM) – models and specifications, process, working principle, applications, advantages and disadvantages.

**UNIT – IV:**

**POWDER BASED RAPID PROTOTYPING SYSTEMS:** Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages.

**UNIT-V:**

**3D PRINTING:** Overview – History – Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology – Tooling – Applications. Three dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages.

**TEXT BOOKS:**

1. Rapid prototyping: Principles and Applications – Chua C.K., Leong K.F. and LIM C.S, World Scientific publications.
2. Rapid Prototyping & Manufacturing – Paul F.Jacobs, ASME Press

**REFERENCE BOOKS**

1. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer.
2. Wholers Report 2000 – Terry Wohlers, Wohlers Associates.

**WEB REFERENCES:**

1. URL:  
[https://mosafavi.iut.ac.ir/sites/mosafavi.iut.ac.ir/files/.../rapid\\_prototyping\\_1\\_0.pdf](https://mosafavi.iut.ac.ir/sites/mosafavi.iut.ac.ir/files/.../rapid_prototyping_1_0.pdf)

**E-B OOKS:**

1. [https://www.cet.edu.in/noticefiles/258\\_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf](https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf)

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code: 19BCC4OE06</b>	<b>OPERATIONS RESEARCH</b>						

**Course Objectives:**

To learn the importance of Operations Research in the design, planning, scheduling, manufacturing and business applications and to use the various techniques of Operations Research in solving such problems.

**Course Outcomes:**

**After successful completion of this course, the students will be able to:**

- CO 1 Illustrate and solve** linear programming problems.
- CO 2 Solve** transportation and assignment problems.
- CO 3 Select** a suitable sequencing and networking models.
- CO 4 Solve** waiting line theory problems.
- CO 5 Analyse** game theory, replacement and simulation problems.

**UNIT-I**

Development-definition, characteristics and phases, types of operation research models, applications.

**LINEAR PROGRAMMING PROBLEM:** Formulation, graphical solution, simplex method, artificial variables techniques, two-phase method, big-M method, duality principle.

**UNIT-II**

**TRANSPORTATION PROBLEM:** Formulation, types of initial basic feasible solution using different methods, optimal solution, unbalanced transportation problem, degeneracy.

**ASSIGNMENT PROBLEM:** Formulation, optimal solution, variants of assignment problem, travelling salesman problem.

**UNIT-III**

**SEQUENCING:** Introduction, flow, shop sequencing,  $n$  jobs through two machines,  $n$  jobs through three machines, job shop sequencing, and two jobs through 'm' machines.

**NETWORKING MODELS:** Earliest Completion time of a project and Critical path, Programme Evaluation Review Technique, Total Slack, Free Slack, Probability of achieving completion date, Cost Analysis, Crashing the network, Resource Scheduling-Advantages, Limitations, Cost Analysis, Distinction between PERT and CPM, LPP Formulation.

#### **UNIT-IV**

**WAITING LINES:** Introduction – single channel – poisson arrivals –exponential service times – with infinite population and finite population models– multichannel – poisson arrivals – exponential service times with infinite population single channel poisson arrivals.

**DYNAMIC PROGRAMMING:** Introduction, Bellman’s principle of optimality, applications of dynamic programming.

#### **UNIT-V**

**THEORY OF GAMES:** Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

**REPLACEMENT:** Replacement Model, Replacement of items that deteriorate, Gradually, Fail suddenly, group Replacement policy analysis, Problems.

**SIMULATION:** Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages

#### **TEXT BOOKS**

1. Operations Research, S.D.Sharma, KedarNath Ram Nath Publishers
2. Operations Research, A.M.Natarajan, P.Balasubramani and A. Tamilarasi, Pearson Education

#### **REFERENCE BOOKS**

1. Introduction to O.R, Hiller & Libermann, Tata McGraw Hill
2. Operations Research, R.Pannerselvam, PHI Publications
3. Operations Research, Wagner, PHI Publications

#### **WEB LINKS:**

- <http://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf>
- <https://www.cs.toronto.edu/~stacho/public/TEOR4004-notes1.pdf>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code: 19BCC5OE05</b>	<b>WORK STUDY</b>						

**COURSE OBJECTIVES**

**The course content enables students to:**

- Think and explore the ways to make the job easy or have time be productive.
- Explain how to improve productivity through work study.

**COURSE OUTCOMES**

**After successful completion of this course, the students will be able to:**

CO1: **Demonstrate** the fundamental concepts of work systems and work study.

CO2: **Demonstrate** the fundamental concepts of method study.

CO3: **Analyse** the movements at workplace.

CO4: **Explain** work measurement and time study.

CO5: **Explain** work sampling and predetermined time standards. Predetermined motion time measurement (MTM).

**UNIT I:**

Productivity: Definition of productivity, individual enterprises, task of management Productivity of materials, and, building, machine and power. Work Study: Definition, objective and scope of work study, advantages. Human factor in work study Work study and management, work study and supervision, work study and worker.

**UNIT II:**

Introduction to Method Study: Definition, objective and scope of method study, activity recording and exam aids. Charts to record moments in shop operation – process charts, flow process charts, travel chart and multiple activity charts.( With simple problems)

**UNIT III:**

Micro and Memo Motion Study: Charts to record moment at work place – principles of motion economy, classification of movements, two handed process chart, SIMO chart, and micro motion study. Development, definition and installation of the improved method.

**UNIT IV:**

Introduction to Work Measurement: Definition, objective and benefit of work measurement. Work measurement techniques. Work sampling: need, confidence levels, and sample size determinations, with simple problems. Time Study: Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating, Systems of rating.

**UNIT V:**

Scales of rating, factors affecting rate of working, allowances and standard time determination. Predetermined motion time study – Method time measurement (MTM) Wages

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

and Incentives: introduction, definition, wage differentials, methods of wage payment, Advantages, disadvantages, financial incentives, non-financial incentives.

### **TEXT BOOKS:**

1. ILO -Introduction to work study, ISBN 13:9788120406025 Publisher: India Book House Pvt. Ltd, 4th Revised Edition, 2008.
2. Ralph M Barnes -Motion and Time study, ISBN: 13:978981426182 Publisher: John Wiley, 7th edition 2009.

### **REFERENCES BOOKS:**

1. M S Sanders and E J McCormic -Human Factors in Engineering Design, ISBN: 13:9780070549012, Mc Graw Hill, 7th Edition, 1992.
2. R.S.Bridger -Introduction to Ergonomics, ISBN: 13:9780849373060, Publisher Taylor and Francis dated 20th Aug 2008, 3rdEdition

### **WEB LINKS:**

1. [http://fmcet.in/MECH/ME2027\\_uw.pdf](http://fmcet.in/MECH/ME2027_uw.pdf)
2. <http://egyankosh.ac.in/bitstream/123456789/31709/1/Unit-6.pdf>
3. <http://egyankosh.ac.in/bitstream/123456789/31709/1/Unit-6.pdf>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code: 19BCC5OE06</b>	<b>MECHATRONICS (Other than ME)</b>						

**COURSE OBJECTIVES**

**The course content enables students to:**

- Understand key elements of Mechatronics system, representation into block diagram
- Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application.

**COURSE OUTCOMES**

**After successful completion of this course, the students will be able to:**

- CO1 Recognize** the elements of a microcontroller as well as the operating principles of motors, sensors, and circuits commonly used in mechatronic devices.
- CO2 Learn** basics of microcontrollers used in mechatronics.
- CO3 Design** and implement different logics and logical controls
- CO4 Assess** various control systems used in automation.
- CO5 Learn** the concepts of mechatronics for various applications.

**UNIT 1: INTRODUCTION TO MECHATRONICS**

**System modelling:** Introduction, system modelling, mechanical system, translational mechanical system with spring, damper and mass, Rotational mechanical system with spring, damper and mass; electrical system, modelling electric motor, fluid system, thermal systems, modeling pneumatic actuator

**UNIT 2: OVERVIEW OF MICROCONTROLLERS**

Basics of microcontrollers, Introduction to Microcontroller Technology, history, applications and challenges cum opportunities.

**UNIT 3: ACTUATORS**

Introduction, actuator types and application areas, mechanical actuation systems, Electrical actuating systems - DC motors, AC motors, stepped motor, solid state switches, solenoids; Fluid power actuators, piezoelectric actuators.

**UNIT 4: DIGITAL LOGIC**

Digital logic, number systems, logic gates, Boolean algebra, karnaugh maps, application of logic gates, sequential logic, PLC, Digital controllers.

**UNIT 5: ADVANCED APPLICATIONS IN MECHATRONICS**

Sensors for condition monitoring, mechatronic control in automated manufacturing, artificial intelligence in mechatronics, Fuzzy logic applications in mechatronics, micro sensors in mechatronics, and contemporary issues.

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

### **TEXT BOOKS**

- 1.W. Bolton, Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering (2010), Pearson Education.
2. Mechatronics system design by Devdas Shetty and Richard A. Kolk, PWS publishing company.

### **REFERENCES**

1. Mechatronics: Principles, concepts and applications by Nitaigour Premchand Mahalik, Tata – McGraw Hill Publishing Company Ltd.
2. Mechatronics: Integrated Mechanical Electronic Systems by K.P. Ramchandran, G.K. Vijayaraghavan, M.S. Balasundaram, Willey Publication, 2008

### **WEB REFERENCES:**

- 1.<https://nptel.ac.in/courses/112/103/112103174/>
- 2.<https://ocw.mit.edu/courses/mechanical-engineering/2-737-mechatronics-fall-2014/>
- 3.<https://nptel.ac.in/downloads/112101098/>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE05	AUTOMOTIVE VEHICLES						

**COURSE OBJECTIVES**

The course content enables students to:

- Obtain an overview of automotive components, subsystems, design cycles, communication protocols and safety systems employed in today's automotive industry.
- Understand Safety standards, advances in towards autonomous vehicles.

**COURSE OUTCOMES**

After successful completion of this course, the students will be able to:

- CO1** Illustrate different types of chassis and body parts.
- CO2** Examine the transmission systems and accessories used in automobiles.
- CO3** Elaborate steering mechanisms.
- CO4** Analyse different braking and suspension mechanisms.
- CO5** Apply the knowledge of electrical systems in the automotive vehicles.

**UNIT-I CHASSIS & BODY**

Classification of vehicle, layout with reference to power plant, steering location and drive, chassis, construction and details (frames, sub-frames, defects in frame, frameless vehicles, vehicle dimensions), details of chassis & body materials, Integrated body construction, Vehicle interior system (dash board & seating system), head roofs.

**UNIT-II TRANSMISSION & DRIVELINE**

Clutches, principle, types, Fluid coupling and torque convertors, problems on performance of automobile such as resistance to motion, tractive efforts, engine speed, power and acceleration requirements. Determination of gear box ratios for different vehicle applications, different types of gear boxes, Automatic transmission, Effect of driving thrust and torque-reaction, Hotchkiss drives, Torque tube drive, radius rods, Propeller shaft, Universal joints, Final drive- different types, two speed rear axle, Rear axle construction: full floating, three quarter floating and semi floating arrangements, Differential: conventional type & Non-slip type, differential locks.

**UNIT-III FRONT AXLE & STEERING**

Front axle types, rigid axle and split axle, constructional details, materials, front wheel geometry viz., camber, castor, kingpin inclination, toe-in and toe-out, Wheel alignment and balancing, Condition for true rolling motion off-road wheels during steering. Steering geometry. Ackermann and Davis steering. Construction details of steering linkages. Different types of steering gear box. Steering linkages layout for conventional and independent Suspensions. Turning radius, instantaneous centre, wheel wobble and shimmy. Over-steer and under-steer. Power and power assisted steering.

**UNIT-IV BRAKING & SUSPENSION**

Type of brakes, Principles of shoe brakes, Constructional details – materials. Disc brake, drum brake theory, constructional details, advantages, Brake actuating systems. Factors affecting brake performance, Parking & Exhaust brakes, power & power assisted brakes, Antilock Braking System (ABS), Testing of brakes.

Types of suspension, factors influencing ride comfort, types of suspension springs (leaf & coil springs), independent suspension (front and rear). Rubber, pneumatic, hydro-elastic suspension, Shock absorbers, types of wheels, types of tyres and constructional details, tubeless tyres and aspect ratio of tubed tyres.

**UNIT-V ELECTRICAL SYSTEM**

Battery, Charging circuit, Alternator, generator, current – voltage regulator – starting systems, mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature, indicator, wiring harness, Trouble shooting.

**TEXT BOOKS:**

1. Sukhatme S.P. and J.K.Nayak, Solar Energy: Principles of Thermal Collection and Storage, TMH
2. Heinz Heisler, “Advanced Vehicle Technology”, second edition, Butterworth – Heinemann, New York, 2002.
3. Automotive Mechanics By William H. Crouse, Donald L. Anglin · 1984.
4. Kirpal Singh, “Automobile Engineering”, Standard publishers, Distributors, Delhi, 1999.

**REFERENCE:**

1. G.B.S.Narang, “Automobile Engineering”, Khanna Publishers, Twelfth reprint New Delhi, 2005.
2. R.P.Sharma, “Automobile Engineering”, Dhanpat Rai & Sons, New Delhi, 2000.
3. Dr. N. K. Giri, “Automobile Mechanics”, Seventh reprint, Khanna Publishers, Delhi, 2005
4. K.K. Ramalingam, “Automobile Engineering “, Scitech Publications (India) PVT.

**WEB LINKS:**

1. [https://web.iitd.ac.in/~achawla/course\\_pdfs/4.%20MEL736/1-Automobile\\_introduction.pdf](https://web.iitd.ac.in/~achawla/course_pdfs/4.%20MEL736/1-Automobile_introduction.pdf)
2. [https://www.rand.org/content/dam/rand/pubs/research\\_reports/RR400/RR443-2/RAND\\_RR443-2.pdf](https://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR443-2/RAND_RR443-2.pdf)
3. <http://160592857366.free.fr/joe/ebooks/Automotive%20engineering%20books/Automotive%20Engineering%20Powertrain,%20Chassis%20System%20and%20Vehicle%20Body.pdf>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE06	NANO TECHNOLOGY						

**COURSE OBJECTIVES****The course content enables students to:**

- Attain foundational knowledge of the Nano science and related fields.
- Acquire an understanding the Nano science and Applications.

**COURSE OUTCOMES****After successful completion of this course, the students will be able to:**

- CO1: Enumerate basics of Nano materials and technology.
- CO2: Illustrate the synthesis of Nano materials.
- CO3: Develop an idea for preparation of Nano size materials.
- CO4: Summarize the knowledge on tools used in Nano technology.
- CO5: Compare different Nano fabrication methods.

**UNIT – I:**

**INTRODUCTION:** Evolution of science and technology, Introduction to Nanotechnology, Nanotechnology - Definition, Significance, Difference between Nano science and Nanotechnology, Feynman predictions on Nanotechnology, Moore's law, Bottom up and top down approaches, challenges in Nanotechnology.

**UNIT – II:**

**NANO MATERIALS, SYNTHESIS:** History of materials, Nanomaterial Definition, Classification of Nanostructured materials, causes of interest in nanomaterial, some present and future applications of nanomaterial, Carbon nanotubes, Nano composites, and Nano fluids-An overview over preparation, properties, and applications.

**UNIT – III:**

**PROCESSING OF NANO MATERIALS:** Processes for producing ultrafine powders mechanical grinding, wet chemical synthesis of nanomaterial. Gas phase synthesis of Nanomaterial, gas condensation processes, chemical vapor condensation, laser ablation.

**UNIT – IV:**

**CHARACTERIZATION AND TOOLS:** Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy, Atomic Force Microscopy, Scanning Probe Microscopy- X ray methods -Fluorescence

**UNIT – V:**

**NANOFABRICATION:** Introduction - micro, nanofabrication: Optical lithography, Electron beam lithography, Atomic lithography, Molecular beam epitaxy, MEMS, NEMS -An introduction. Nanotechnology applications in Mechanical Engineering: Nano mechanics, Nano scale heat transfer, Nano-machining, molecular dynamic simulation - An introduction

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

### **TEXT BOOKS:**

1. Nano science and nanotechnology by M.S. Ramachandra Rao, Shubrasingh, Wiley publishers
2. Nano structures & Nano materials by Guozhongcao, Imperial college press.2nd Edition

### **REFERENCE BOOKS**

1. Micro manufacturing and Nano Technology by N.P.Mahalik,.Springer,2006
2. Nano Technology by Mark Ratner & Danier Ratner, Prentice Hall
3. Nano materials by A S Edelstein& R C Cammarata, Institute of physics publishing, Bristol and Philadelphia.

### **WEB LINKS:**

1. <https://core.ac.uk/download/pdf/55611506.pdf>
2. <https://ec.europa.eu/programmes/erasmus-plus/project-result-content/fe710461-5da6-42bd-9351-828558ab56da/Nanotechnology%201%20Fundamentals%20of%20Nanotechnology.pdf>
3. [https://www.kth.se/social/upload/54062f97f2765416cecdfd74/HT14-IM2655\\_Lecture%201.pdf](https://www.kth.se/social/upload/54062f97f2765416cecdfd74/HT14-IM2655_Lecture%201.pdf)

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

Open Elective-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code: 19BCC7OE05</b>	<b>PNEUMATICS &amp; HYDRAULIC AUTOMATION</b>						

### COURSE OBJECTIVES

The course content enables students to:

- Equip the student with fundamental knowledge of fluid power systems, pneumatic systems and hydraulic systems.
- Develop knowledge of the performance of hydraulic circuits using various hydraulic elements. Pneumatic circuits using various Pneumatic elements

### COURSE OUTCOMES

After successful completion of this course, the students will be able to:

- CO 1 Compare** the Pneumatic and Hydraulic systems working principles and components.
- CO 2 Explain** the performance of hydraulic actuators using cylinders.
- CO 3 Explain** the fluid control valves working and construction.
- CO 4 Analyze** the performance of hydraulic circuits using various hydraulic elements.
- CO 5 Analyze** the performance of Pneumatic circuits using various Pneumatic elements

### UNIT – I:

**INTRODUCTION TO PNEUMATIC AND HYDRAULICS:** Fluid Power and Its Scope, Applications of fluid power. Advantages and disadvantages of fluid power Classification of Fluid Power Systems, Basic Components of a Hydraulic System, Basic Components of a Pneumatic System, Comparison between Hydraulic and Pneumatic Systems, Comparison of different power systems.

### UNIT – II:

**HYDRAULIC & PNEUMATIC ACTUATORS:** Classification of hydraulic & pneumatic actuators, hydraulic & pneumatic cylinders - construction and working of single acting and double-acting cylinders, Graphical symbols of different linear actuators, Cylinder Force, Velocity and Power, Various Methods of Applying Linear Motion Using Hydraulic Cylinders- vertical cylinder, Horizontal cylinder, Inclined cylinder. First, Second and Third Class Lever Systems.

### UNIT – III:

**FLUID POWER CONTROL VALVES:** Different types of valves used in fluid power, Directional control valves (DCV) - classifications - working and construction of various direction control valves -applications, Pressure-control valves (PCV) – classifications –

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Working construction of various pressure control valves – applications. Flow control valves (FCV) - classifications - working construction of various flow control valves - applications. Time delay, quick exhaust, twin pressure, and shuttle.

### **UNIT – IV:**

**HYDRAULIC CIRCUITS:** Various hydraulic circuits, Nomenclature, Graphical Symbols, Control of a Single-Acting Hydraulic Cylinder and a Double-Acting Hydraulic Cylinder, Double-pump circuit, sequencing circuit, Circuit for Fast Approach and Slow Die Closing, Performance of hydraulic circuits using various hydraulic elements

### **UNIT – V:**

**PNEUMATIC CIRCUITS:** Basic pneumatic circuits, Nomenclature, Graphical Symbols, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Cascade method for sequencing, introduction to piping and its software's.

### **TEXT BOOKS:**

1. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw Hill.
2. Hydraulics, Fluid Mechanics and Hydraulic Machinery by P.N. Modi, S.M. Seth, Standard Book House.
3. Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S. Chand *Publishing*
4. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.

### **REFERENCES:**

1. Hydraulic and Pneumatic Controls: Understanding made Easy by K.Shanmuga Sundaram, S.Chand, New Delhi, 2006
2. Fluid Mechanics and Fluid Power Engineering by D.S.Kumar, SK Kataria and Sons.
3. Fluid Power with Applications by Anthony Esposito, Pearson.

### **WEB REFERENCES:**

1. <https://nptel.ac.in/courses/112/105/112105047/>
2. <https://nptel.ac.in/courses/112/105/112105046/>
3. [http://www.just.edu.jo/~haalshraideh/Courses/IE431/Lecture\\_slides/Hydrolics%20and%20Pneumatics.pdf](http://www.just.edu.jo/~haalshraideh/Courses/IE431/Lecture_slides/Hydrolics%20and%20Pneumatics.pdf)

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC7OE06	<b>Industrial Robotics (Other than ME)</b>						

**COURSE OBJECTIVES**

**The course content enables students to:**

- Introduce the concepts of Robotic system, its components and control related to robotics.
- Learn about analysing robot kinematics.

**COURSE OUTCOMES**

**After successful completion of this course, the students will be able to:**

**CO1: Identify** Robot terminology and importance

**CO2: Select** appropriate type of actuators for different applications

**CO3: Choose** appropriate sensors for different applications

**CO4: Analyze** the kinematics of robot related to transformations

**CO5: Illustrate** present and future applications for robots

**UNIT 1: FUNDAMENTALS OF ROBOTICS**

**Introduction to Robotics:** Robot and industrial robots, advantages, components of robot, Robot history, robotic controls and systems, classification, challenges and opportunities, the scenarios of industrial robotics and advanced robotics

**UNIT 2: ACTUATORS**

**Actuators** – Types, working principles, applications and advancements (hydraulic devices, Electric motors such as DC servomotors and stepper motors, Pneumatic devices, as well as other novel actuators)

**UNIT 3: SENSORS**

**Sensors** – Basic Elements, General Classification of Sensors, types and working, use of sensors in robotics.

**UNIT 4: ROBOT KINEMATICS**

The fundamentals of kinematics, differential kinematics and statics: Kinematic chains, Forward kinematics, The Jacobian and its properties, Inverse kinematics: analytical methods

**UNIT 5: APPLICATIONS**

**Robot Application in Manufacturing:** Material Transfer, Material handling, loading and unloading, Processing, spot and continuous arc welding & spray painting, Assembly and Inspection. Future applications of robots. Path planning in robotics.

**TEXT BOOKS:**

1. Industrial Robotics, Groover M P, Pearson Education.
2. Robotics: Fundamental Concepts and Analysis, Ashitava Ghosal, Oxford Publications.

**REFERENCES:**

1. Robotics and Control, Mittal R K & Nagrath I J, Tata McGraw Hill.
2. Robotic Engineering, Richard D. Klafter, Prentice Hall.

**WEB REFERENCES:**

1. <http://planning.cs.uiuc.edu/node659.html>
2. <https://www.edx.org/course/robot-mechanics-and-control-part-i>
3. <https://www.edx.org/course/robotics-foundation-ii-robot-control>
4. <https://nptel.ac.in/courses/112/105/112105249/>
5. <http://www.robotictutorials.com/> → for tutorials
6. ARC lab material – in house Dept. of Mechanical Engineering, NEC

**VIRTUAL LAB RESOURCES FOR PRACTICE AND TUTORIALS:**

1. <http://vlabs.iitkgp.ernet.in/rislab/>
2. <http://www.mind.ilstu.edu/teachers/labs/robot/>
3. <http://vlab.amrita.edu/?sub=3&brch=271&sim=1642&cnt=3525>
4. <https://www.virtualroboticstoolkit.com/>

<https://www.robotlab.com/blog/robotlab-is-offering-free-online-virtual-robotics-and-coding-courses-to-those-affected-by-covid-19>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**LIST OF OPEN ELECTIVES OFFERED BY ELECTRONICS & COMMUNICATION  
ENGINEERING DEPARTMENT****Open Elective-I**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Principles of Signals, Systems & Communications (Other than ECE)	ECE	19BCC4OE07	3	0	0	3
2	Medical Electronics	ECE	19BCC4OE08	3	0	0	3

**Open Elective-II**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Fundamentals of Image Processing (Other than ECE)	ECE	19BCC5OE07	3	0	0	3
2	Consumer Electronics	ECE	19BCC5OE08	3	0	0	3

**Open Elective-III**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Introduction to Embedded Systems (Other than ECE)	ECE	19BCC6OE07	3	0	0	3
2	Global Positioning System(GPS)	ECE	19BCC6OE08	3	0	0	3

**Open Elective-IV**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Introduction to Micro Processors & Micro Controllers(Other than ECE)	ECE	19BCC7OE07	3	0	0	3
2	Automotive Electronics	ECE	19BCC7OE08	3	0	0	3

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDIT S
	3	0	0	40	60	100	3
Code: 19BCC4OE07	PRINCIPLES OF SIGNALS, SYSTEMS AND COMMUNICATIONS (Other than ECE)						

**COURSE OBJECTIVES:**

1. To analyze different types of signals, systems.
2. Analyze basic signals in frequency domain by using Fourier series and Fourier Transform.
3. To explain the principles of linear system.
4. To classify various analog modulation techniques.
5. To develop the concepts of pulse modulation and digital modulation techniques.

**COURSE OUTCOMES:** After completion of this course, the student should able to

**CO1:** Explain basic concepts of signals.

**CO2:** Analyse time-domain signals in frequency-domain using Fourier transforms.

**CO3:** Demonstrate the concepts of linear systems.

**CO4:** Illustrate various analog modulation techniques.

**CO5:** Compare various digital modulation techniques.

**SYLLABUS:****UNIT – I: INTRODUCTION TO SIGNALS**

Introduction of Standard Signals, Signal Operations- Time Shifting, Scaling and Reversal  
Classification of Signals- Analog, Digital, Discrete, Periodic and Aperiodic, Even and Odd, Energy and Power.

**UNIT – II: SIGNAL ANALYSIS**

Introduction to Fourier Series - Trigonometric and Exponential Fourier Series, Fourier Transform - Analysis of non-periodic functions, Fourier Transform of standard signals, Properties of Fourier Transform.

**UNIT – III: LINEAR SYSTEMS**

Introduction, Definition of system function, Classification of systems.

Distortion less transmission, Signal bandwidth and System band width; Energy signals and Power signals.

**UNIT – IV: INTRODUCTION TO COMMUNICATION SYSTEM**

Need for Modulation, Types of Modulation, Amplitude modulation- Generation of AM, Demodulation of AM, Frequency modulation, Phase modulation, Types of FM.

**UNIT – V: PULSE MODULATION****Pulse Analog Modulation:**

PAM Modulation and Demodulation, PWM and PPM- modulation and demodulation, Time Division Multiplexing, Frequency Division Multiplexing.

**Pulse Digital Modulation:**

PCM System, Differential pulse code modulation, Delta Modulation, Adaptive delta modulation and comparisons. ASK, FSK, PSK and comparison.

**Text Books:**

1. R. P. Singh, S. D. Sapre, "Communication systems - Analog and Digital, Tata McGraw Hill, Reprint 2003.
2. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.
3. B.P.Lathi, "Signals systems and communication", BS Publications, 2008.

**Reference Books:**

1. Simon Haykin, John Wiley, "Communication Systems", 3<sup>rd</sup> Edition, 2008.
2. P. Ramesh Babu, R. Anandanatarajan, "Signals and Systems", Scitech Publications, 4<sup>th</sup> Edition, 2006.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC4OE08	MEDICAL ELECTRONICS						

**COURSE OBJECTIVES:**

1. Discuss basic medical terms and physical values that can be handled by medical instrumentation.
2. Explain electro-physiology and bio-potential recording.
3. Demonstrate measuring of basic medical parameters.
4. Utilize basic parameters of the equipment for using in electro diagnostic and electro therapy.
5. Discuss Biotelemetry & Computer Applications in Biomedical field.

**COURSE OUTCOMES:** After completion of this course, the student should able to

**CO1:** Identify basic understanding of medical terminology and relevant for biomedical Instrumentation.

**CO2:** Explain methods and implementation of electrical and nonelectrical medical parameters.

**CO3:** Illustrate the effect of different diagnostic and therapeutic methods for different medical procedures.

**CO4:** Examine the concept of Biotelemetry & Telemedicine

**CO5:** List out Computer Applications in Biomedical field.

**SYLLABUS:****UNIT - I: ANATOMY AND PHYSIOLOGY**

Physiological Systems of the Body, Basic Medical Instrumentation System, Elementary ideas of cell structure, Cell and its structure, Characteristics of Living Organisms, Nervous system, Nerve cell, Heart and circulatory system, Muscle action, Respiratory system.

**UNIT - II: OVERVIEW OF MEDICAL ELECTRONICS EQUIPMENT**

Fundamentals, Performance Requirements of Medical Instrumentation System, Intelligent Medical Instrumentation System, General Constraints in design, Regulation of Medical Devices.

**UNIT - III: ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING**

The origin of Bioelectric Signals, Electrolyte Interface, Electrode Types – Surface Metal Plate Electrodes, Bio potential electrodes, Needle and Wire Electrodes, Micro Electrodes, Recording Electrodes.

Electrodes for ECG, Electrodes for EEG Electrodes, for EMG, Electrical Conductivity of Electrode Jellies and Creams.

**UNIT-IV: BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT**

Blood pH Measurement, Blood PO<sub>2</sub> Measurement, Measurement of Blood PCO<sub>2</sub>, Internal-arterial Blood Gas Monitoring, A Complete Blood Gas Analyser, Blood Cell Counters, Types Of Blood Cells, Methods of Cell Counting, Automatic Recognition and Differential Counting of cells.

**UNIT-V: BIOTELEMETRY & BIOMEDICAL COMPUTER APPLICATIONS**

Introduction, Wireless Telemetry, Single-Channel Telemetry Systems, Multi-Channel wireless Telemetry Systems, Multi-Patient Telemetry, Implantable Telemetry Systems, Transmission of Analog Physiological Signals over Telephone, Telemedicine. Computer Analysis of the ECG, CAT scanner, Computerized Aid to Patient Monitoring.

**Text Books:**

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2003.
2. C. Raja Rao, Sujoy K. Guha, “Principles of Medical Electronics and Biomedical Instrumentation”, Universities Press (India) Ltd, 2001.

**References Books:**

1. John G. Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007
2. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004.
3. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
4. Edward J. Bukstein, “Introduction to BioMedical Electronics”, Howard W Sams, USA, 1973.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC5OE07	FUNDAMENTALS OF IMAGE PROCESSING						

**COURSE OBJECTIVES:**

1. To introduce the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images.
2. To comprehend the relation between human visual system and machine perception and processing of digital images.
3. To introduce the concepts of image processing and basic analytical methods to be used in image processing.
4. To familiarize students with image enhancement and restoration techniques
5. To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

**COURSE OUTCOMES:** After completion of the course, students will be able to

1. Interpret the limitations of the computational methods on digital images.
2. Develop Fourier transform for image processing in frequency domain.
3. Illustrate the spatial and frequency domain image transforms on enhancement and restoration of images.
4. Utilize the understanding of image enhancement techniques.
5. Define the need for compression and evaluate the basic compression algorithms.

**SYLLABUS:****UNIT – I: Digital Image Fundamentals & Image Transforms**

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hoteling Transform.

**UNIT – II: Image Enhancement (Spatial Domain)**

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighbourhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

**UNIT – III: Image Restoration**

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT – IV: Image Segmentation**

Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation. Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

**UNIT – V: Image Compression**

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

**Text Books:**

1. Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- MC GRAW HILL EDUCATION, 2010.
3. A.K.Jain, Fundamentals of Digital Image Processing, Prentice Hall.

**Reference Books:**

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, MC GRAW HILL EDUCATION, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC5OE08	CONSUMER ELECTRONICS						

**COURSE OBJECTIVES:**

1. Understand the principle and operation of microphones and loud speakers, study the recording and reproduction of sound without significant noise.
2. Understand the elements of television, scanning process and transmission of composite video signal.
3. Understand the essentials of colour television, signal transmission and colour television standards.
4. Understand the TV controls, digital TV, direct to home (DTH) system and Cable television (CATV).
5. Understand the operation of office equipment and domestic appliances such as microwave ovens, air conditioners, fax machine etc.

**COURSE OUTCOMES:** After undergoing the course, students will be able to:

**CO1:** List technical specification of electronics Audio system (microphone and Loud speaker).

**CO2:** Demonstrate audio and video recording systems.

**CO3:** Contrast working principles of Monochrome TV and Colour TV.

**CO4:** Outline Broadcasting techniques of CATV and DTH TV.

**CO5:** Illustrate the basic functions of various consumer electronic domestic Appliances.

**SYLLABUS:****UNIT-I: MICROPHONES AND LOUDSPEAKERS**

Principle of Microphones, Characteristics of Microphones, Types of Microphones, Principle of Loudspeakers and Headphones, Types of loudspeakers, Types of Headphones, Speaker Baffles and Enclosures.

**UNIT-II: AUDIO SYSTEMS**

Acoustics, Audio recording and reproduction: Gramophone disc recording, Magnetic tape recording, Optical disc recording, Hi-Fi(High-Fidelity) system, Stereophony, PA(Public Addressing) system, Equalizers and Mixers, Noise reduction in audio systems.

**Video Recording:** Video recording and reproduction using magnetic tape, Video recording and reproduction using optical disc.

**UNIT-III: MONOCHROME and COLOUR TV**

**Monochrome TV:** Elements of a Television System, Analysis and Synthesis of monochrome Television Pictures, Scanning process, Composite Video Signal, Synchronization, TV Standards, Monochrome TV Camera, Camera Tube characteristics, Monochrome picture tube.

**Colour TV:** Essentials of colour television, three colour theories, the luminance signal, and Colour television display tubes, Colour signal transmission and reception, Colour TV standards, Merits and demerits of different colour TV standards.

**UNIT-IV: TV CONTROLS, CABLE TV AND DIGITAL TV**

Operating and servicing controls of Monochrome and Colour TV receivers, Remote controls, TV applications, and TV Broadcasting system, DTH TV, Cable television (CATV), MAC Encoder and Decoder, Digital TV System.

**UNIT–V: OFFICE EQUIPMENT AND DOMESTIC APPLIANCES**

Fax (Facsimile) machine, Xerography, Calculators, Digital clocks, Microwave Ovens, Washing machines, Air conditioners, Refrigerators.

**Text Books:**

1. S P Bali, “Consumer Electronics”, Pearson First Impression, 2008.
2. R R Gulati, “Monochrome and Colour Television”, 2<sup>nd</sup> Edition, New Age International Publishers, 2009.

**References Books:**

1. R G Gupta, “Audio and Video Systems: Principles, Maintenance and Troubleshooting” , Tata McGraw Hill, 2010.
2. Roy Blake, “Electronic communication systems”, Thomson Delmar, 2002.
3. R R Gulati, “Colour Television”, 2<sup>nd</sup> Edition, New Age International Publishers, 2007.
4. Robert L. Goodman, “How electronic Things Work and What to Do when they don’t”, Tata McGraw Hill, 2002.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE07	INTRODUCTION TO EMBEDDED SYSTEMS						

**COURSE OBJECTIVES:**

1. To gain knowledge and fundamental concepts and basic building blocks of an embedded system
2. To learn characteristics, quality attributes and applications of embedded systems
3. To understand the concept of real time operating systems
4. To learn the RTOS basics and various Communication & Synchronization techniques
5. To understand the classification and applications of embedded systems

**COURSE OUTCOMES:** After completion of the course, the student will be able to

**CO1:** Illustrate the classification and applications of embedded systems.

**CO2:** Recall the basic memory devices, passive components and core of embedded systems.

**CO3:** Summarize various Communication interface in Embedded Systems.

**CO4:** Demonstrate characteristics of embedded systems.

**CO5:** Explain the RTOS basics and various Communication & Synchronization techniques.

**SYLLABUS:****UNIT-I: INTRODUCTION**

Embedded Systems vs. general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems.

**UNIT-II: CORE AND MEMORY**

Core of the embedded system: general purpose and domain specific processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).

Memory: ROM, RAM, memory according to the type of interface, memory shading, memory selection for embedded system.

**UNIT-III: COMMUNICATION INTERFACE AND EMBEDDED SYSTEM COMPONENTS**

Communication Interface: On-board and external Communication Interfaces embedded firmware.

Embedded system Components: reset circuit, brown-out protection circuit, oscillator unit, Real Time Clock (RTC), watchdog timer, PCB and passive components.

**UNIT-IV: CHARACTERISTICS, QUALITY ATTRIBUTES AND EXAMPLES OF EMBEDDED SYSTEMS.**

Characteristics of embedded systems and quality attributes of embedded systems. Embedded systems application and domain-specific: washing machine-application-specific embedded system, automotive- domain-specific embedded system

**UNIT-V: RTOS BASED EMBEDDED SYSTEM DESIGN**

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling. Task communication, task synchronization,

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

task communication/synchronization issues, task synchronization techniques, device drivers, how to choose an RTOS?

### **Text Books:**

1. Shibu K.V, "Introduction to Embedded Systems", Mc Graw Hill Education, 2013.
2. Raj Kamal, "Embedded Systems", TMH, 2007.
3. Tammy Noergaard, "Embedded systems Architecture", Elsevier publications, 2005.

### **Reference Books:**

1. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley, 1999.
2. David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE08	GLOBAL POSITIONING SYSTEM						

**COURSE OBJECTIVES:**

1. To understand the fundamental concepts of GPS.
2. To analyze the GPS observables.
3. To Demonstrate the Surveying Procedure.
4. To list the different methods of processing GPS data.
5. To conclude various application areas of GPS.

**COURSE OUTCOMES:** After completion of the course, the student will be able to

**CO1:** Identify the importance of Space segment, Control segment and User segment in GPS.

**CO2:** Analyse the GPS observables like code, phase pseudo ranges, Doppler data and Biases.

**CO3:** Estimate surveying with GPS.

**CO4:** Categorize the different application areas of GPS.

**CO5:** Recommend the Hardware and Software improvements for future GPS.

**SYLLABUS:****UNIT-I: OVERVIEW OF GPS**

Basic concepts- History of GPS, Basic definitions, GPS system operation, Trilateration method. Space segment- constellation, satellites, operational capabilities, denial of accuracy and access. Control segment- master control station, monitor stations, ground control stations. User segment- user categories, receiver types, information services.

**UNIT-II: GPS OBSERVABLES**

Data acquisition- code pseudo ranges, phase pseudo ranges, Doppler data, biases and noise. Data combinations- linear phase combinations, code, pseudo range smoothing. Atmospheric effects- phase and group velocity, ionospheric refraction, tropospheric refraction, atmospheric monitoring. Relativistic effects- special relativity, general relativity, relevant relativistic effects of GPS. Antenna Phase centre offset and variation Multipath- general remarks, mathematical model, multipath reduction.

**UNIT-III: SURVEYING WITH GPS**

Introduction-terminology definitions-code range vs. carrier phase, real time processing vs. post processing, point positioning vs. relative positioning, static vs. kinematic, static point processing vs. kinematic point processing, and static relative positioning vs. kinematic relative positioning. Observation techniques- point positioning, differential GPS, relative positioning. Field equipment Planning a GPS survey- General remarks, Pre survey planning, field reconnaissance, monumentation, organizational design. Surveying Procedure-pre observation, observation, post observation, ties to control monuments. In Situ data Processing- data transfer, data processing, trouble shooting and quality control, datum transformations, computation of plane coordinates, Survey report.

**UNIT-IV: APPLICATIONS OF GPS**

General Uses of GPS- global uses, regional uses, local uses. Attitude determination- theoretical and practical considerations. Air borne GPS for photo control. Interoperability of GPS- GPS and inertial navigation systems, GPS and GLONASS, GPS and other sensors.

**UNIT–V: FUTURE OF GPS**

New application aspects. GPS modernization- future GPS satellites, augmented signal structure. GPS augmentation- ground based and satellite based augmentation. GNSS - GNSS development, GNSS/Loran-C integration. Hardware and software improvements- Hardware, Software.

**Text Books:**

1. B. Hofmann- Wellnhoff , H. Lichtenegger and J. Collins, “GPS theory and practice” , Fifth edition, Springer-Verlag Wien, Newyork, 2001.
2. Bradford W. Parkinson, James Spilker, “Global Positioning System: Theory and Applications”, Vol. I, 1996.

**Reference Books:**

1. Gunter Seeber, “Satellite Geodesy Foundations, Methods and Applications”, Walter de Gruyter publications, 2003.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC70E07	<b>INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS</b>						

**COURSE OBJECTIVES:**

1. To familiarize the students with architecture of 8086 microprocessor and 8051 microcontroller.
2. To introduce the assembly language programming concepts of 8086 processor.
3. To expose the students to various interfacing devices with 8086.
4. To introduce the concepts of interrupt mechanism.

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

**CO1:** Explain the architecture of 8086 microprocessor.

**CO2:** Demonstrate programming proficiency using Instruction set.

**CO3:** Analyse concept of interfacing different peripheral devices with 8086.

**CO4:** Interpret the memory organization and I/O management of 8051.

**CO5:** Summarize various interfacing and applications of 8051.

**UNIT–I: 8086 MICROPROCESSOR**

Evolution of Microprocessors, Introduction to 8086 Processor, Architecture-Functional diagram, Register Organization, Physical memory organization, signal descriptions of 8086-common function signals, Minimum and Maximum mode signals, Timing diagrams.

**UNIT–II: INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086**

Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations. Interrupt structure of 8086, Vector interrupt table, Interrupt service routine.

**UNIT–III: BASIC PERIPHERALS AND THEIR INTERFACING**

8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, Keyboard/Display Controller-8279, Memory interfacing to 8086, Interfacing DMA controller 8257 to 8086.

**UNIT–IV: 8051 MICROCONTROLLER**

Microprocessors vs. Microcontrollers. Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, addressing modes and instruction set of 8051, Interrupts, timer/Counter and serial communication.

**UNIT–V: INTERFACING AND APPLICATIONS OF 8051**

Interfacing 8051 to LED's, Push button, Relays and latch Connections, Keyboard Interfacing, Interfacing Seven segment display, ADC and DAC Interfacing.

**Text Books:**

1. A. K. Ray, K.M. Bhurchandi, “Advanced Microprocessors and Peripherals”, TMH, 2000.
2. D. V. Hall’ “Microprocessors and Interfacing”, 3<sup>rd</sup> Edition,Mcgraw Higher Ed, 2012.
3. Muhammad Ali Mazidi, Janice GillispieMazidi and RolinD.McKinlay, “The 8051 Microcontrollers and Embedded Systems”, 2<sup>nd</sup> Edition,Pearson, 2007.

**Reference Books:**

1. Barry B. Brey, “The Intel Microprocessors”, 7<sup>th</sup> Edition,PHI, 2006.
2. Liu and GA Gibson, “Micro Computer System 8086/8088 Family Architecture. Programming and Design”, 2<sup>nd</sup> Edition, PHI, 1985.
3. Kenneth. J. Ayala, “The 8051 Microcontroller”, 3<sup>rd</sup> Edition, Cengage Learning, 2010.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE – IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code:</b> 19BCC7OE08	<b>AUTOMOTIVE ELECTRONICS</b>						

**Course Objectives:**

1. To understand the concepts of Automotive Electronics and its evolution and trends
2. To understand the basic electronic components used in automotive systems.
3. To understand all the sensors, actuators and electronics engine control in automotive systems.
4. To understand the basics of microcomputer system and its applications.
5. To understand various communication systems used in vehicle.

**Course Outcomes:**

After completion of this course, the student will be able to

**CO1:** Define basics of automotive and electronics fundamentals.

**CO2:** List out the different types of electronic components.

**CO3:** Explain the concepts involved in micro computer system.

**CO4:** Classify and demonstrate various types of Sensors and Actuators.

**CO5:** Make use of Future Automotive Electronic Systems for building prototypes and to be able to demonstrate practical competence in these areas.

**UNIT – I: AUTOMOTIVE FUNDAMENTALS**

Use of electronics in the automobile, evolution of automotive electronics, the automobile physical configuration, Motivation for electronic engine control, exhaust emissions, fuel economy, concept of an electronic engine control system, engine functions and control, electronic fuel control configuration, electronic ignition with sensors.

**UNIT – II: ELECTRONICS FUNDAMENTALS**

Semiconductor devices- diodes, rectifier circuit, transistors, field effect transistors; transistor amplifiers, use of feedback in op amps, summing mode amplifier, analog computers, digital circuits- binary number system, combinational- Basic logic gates, multiplexer (IC 74151), 3 to 8 decoder (IC74138) , sequential- flip flops, decade counters(IC 7490).

**UNIT – III: AUTOMOTIVE MICRO-COMPUTER SYSTEM**

Microcomputer fundamentals-digital versus analog computers, basic computer block diagram, microcomputer operations, CPU registers, accumulator registers, condition code register-branching; microprocessor architecture, memory-ROM,RAM; I/O parallel interface, digital to analog converter and analog to digital converters with block diagram, microcomputer application in automotive systems.

**UNIT – IV: SENSORS AND ACTUATORS**

Introduction; Basic sensor arrangement; Types of Sensors such as oxygen sensors, Crank angle position sensors, fuel Metering/vehicle speed sensors and detonation sensors, altitude sensors, flow Sensors, throttle position sensors, solenoids, stepper motors, relays. Actuators – Fuel Metering Actuator, Fuel Injector, Ignition Actuator

**UNIT – V: FUTURE AUTOMOTIVE ELECTRONIC SYSTEMS**

Telematics, Safety: Collision Avoidance Radar warning System with block diagram, speech synthesis, sensor multiplexing, control signal multiplexing with block diagram, fiber optics inside the car, automotive internal navigation system, GPS navigation system, voice recognition cell phone dialling, advanced cruise control system.

**Text Books:**

1. William B. Ribbens, “Understanding Automotive Electronics”, 6th Edition, SAMS/Elsevier Publishing.
2. Robert Bosch GmbH, “Bosch Automotive Electrics and Automotive Electronics”, 5th Edition, Springer, 2007.

**Reference Books:**

1. Ronald K Jurgen, “Automotive Electronics Handbook”, 2nd Edition, McGrawHill, 1999.
2. G. Meyer, J. Valldorf and W. Gessner, “Advanced Microsystems for Automotive Applications”, Springer, 2009.
3. Robert Bosch, “Automotive Hand Book” SAE, 5th Edition, 2000.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**LIST OF OPEN ELECTIVES OFFERED BY COMPUTER SCIENCE AND  
ENGINEERING DEPARTMENT****OPEN ELECTIVE-I**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	DBMS (Other Than CSE)	CSE	19BCC4OE09	3	0	0	3
2	Web Development Using Mean Stack Tech	CSE	19BCC4OE10	3	0	0	3

**Open Elective-II**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	ARTIFICIAL INTELLIGENCE	CSE	19BCC5OE09	3	0	0	3
2	OOPS through JAVA	CSE	19BCC5OE10	3	0	0	3

**Open Elective-III**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Cloud Computing	CSE	19BCC6OE09	3	0	0	3
2	Block Chain Technologies	CSE	19BCC6OE10	3	0	0	3

**Open Elective-IV**

S.No.	Subject Title	Department	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Cyber Security	CSE	19BCC7OE09	3	0	0	3
2	Ethical Hacking	CSE	19BCC7OE10	3	0	0	3

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
Code: 19BCC4OE09	<b>DATABASE MANAGEMENT SYSTEMS (OTHER THAN CSE)</b>						

**COURSE OBJECTIVE:**

Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications

**COURSE OUTCOMES:**

After completion of this course, the students would be able to

**CO 1: Classify** various Data models, Architectures and their implications

**CO 2: Analyse** DB design methodology and normalization process

**CO 3: Interpret** how queries are being processed and executed in RDBMS

**CO 4: Compare** the various transaction and concurrency management techniques

**UNIT- I: INTRODUCTION**

Database system, Characteristics - Database vs. File System, Database Users -Actors on Scene, Workers behind the scene; Advantages of Data base systems, and Database applications, Brief introduction of different Data Models - Hierarchical, Network and Relational; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, Centralized and Client Server architecture for the database.

**UNIT- II: ENTITY RELATIONSHIP MODEL**

Introduction, Representation of entities, attributes, entity set, relationship, relationship set, Key constraints - Key constraints for Ternary Relationships, participation constraints, class hierarchies, Aggregation; sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**RELATIONAL MODEL**

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values - Comparisons Using Null Values, Logical Connectives AND, OR, and NOT, Impact on SQL Constructs, Disallowing Null Values; Integrity constraints in SQL - Domain constraints, Entity constraints, Referential integrity constraints, Assertions.

**UNIT- III: SQL**

Form of a basic SQL Query, Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, Simple Database schema, data types, table definitions, different DML operations, basic SQL querying using where clause, arithmetic and logical operations, SQL functions - Date and Time, Numeric, String conversion; Creating tables with relationship, implementation of key and integrity constraints, nested queries, correlated

Nested Queries, set- Comparison Operators, sub queries, grouping, aggregate operators, ordering, implementation of different types of joins, view - updatable and non-updatable;

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

relational set operations, SQL constructs that grant access or revoke access from user or user groups.

### **UNIT- IV: SCHEMA REFINEMENT (NORMALIZATION)**

Problems Caused by Redundancy [Null Values], Decompositions, Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Normal forms based on functional dependency - 1NF, 2NF and 3NF.

**Transaction Management:** Transaction - Single-User versus Multiuser Systems; Transactions, Database Items, Read and Write Operations, and DBMS Buffers.

### **UNIT- V: CONCURRENCY CONTROL**

Why Concurrency Control Is Needed, Why Recovery Is Needed, Transaction States and Additional Operations, The System Log, Commit Point of a Transaction, properties of transactions, Characterizing Schedules Based on Serializability - Serial, Non serial, Two-Phase Locking Techniques for Concurrency Control - Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking, Dealing with Deadlock and Starvation.

### **Introduction to Indexing:**

Types of Single- Level Ordered Indexes - Primary Indexes, Clustering Indexes, Secondary Indexes.

### **TEXT BOOKS:**

1. Database Management Systems - Raghuram Krishnan, Johannes Gehrke, TMH, Third Edition, 2003.
2. Fundamentals of Database Systems - Ramez Elmasri, Shamkant B. Navathe, PEA, Sixth Edition, 2010.

### **REFERENCE BOOKS:**

1. Database System Concepts - Silberschatz, Korth, TMH, Fifth Edition, 2006.
2. Introduction to Database Systems - C J Date, PEA, Eighth Edition, 2006.

### **ADDITIONAL RESOURCES:**

1. [nptel.ac.in/courses/106106093](http://nptel.ac.in/courses/106106093)
2. [nptel.ac.in/courses/10610413](http://nptel.ac.in/courses/10610413)

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Open Elective-I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTL MARKS	CREDITS
	3	-	-	40	60	100	3
Code: 19BCC4OE10	<b>WEB DEVELOPMENT USING MEAN STACK TECH</b>						

**COURSE OBJECTIVE:**

- This course is designed to introduce students to learning how to design both the front and back end of web applications. The course will introduce web-based media-rich programming tools for creating interactive web pages.

**COURSE OUTCOMES:**

After completion of this course, the students would be able to

- CO1:** Apply Angular8 to develop web applications. [K3]  
**CO2:** Make use of Forms and Services. [K3]  
**CO3:** Utilize Node.js to create Server Side Applications. [K3]  
**CO4:** Make use of Express to deploy web applications. [K3]  
**CO5:** Experiment with NoSQL using MongoDB. [K3]

**Unit-I: Angular8:** Introduction, Installation, Creating First Angular8 Application, Architecture, Angular Components and Templates, Data Binding, Directives, Pipes, Reactive Programming.

**Unit-II: Angular8:** Services and Dependency Injection, Http Client Programming, Angular Material, Routing and Navigation, Animations, Forms, Form Validation, CLI Commands.

**Unit-III: Node.js:** Introduction, Git Basic commands, Node.js Process Model, Node.js Console, Node.js Basics, Node.js Modules, Local Modules, Export Module, Node Package Manager, Node.js Web Server.

**Unit-IV: Node.js contd. & Express.js:** Node.js File System, Debugging Node.js, Node Inspector, Node.js Event Emitter, Frameworks for Node.js. **Express.js:** Express.js Web App, Serving Static Resources.

**Unit-V: MongoDB:** Access MongoDB in Node.js, Connecting MongoDB, Insert Documents, Update/Delete Documents, Query Database, Mangoose.

**TEXT BOOKS:**

1. Node.js, MongoDB and Angular Web Development by Brad Dayley, Brendan Dayley- 2nd Edition – Addison -Wesley
2. MEAN Cookbook by Nicholas McClay - Packt

**REFERENCES BOOKS:**

1. Node.js: Web Development for Beginners by Joseph Conner
2. Mean Stack Developer by Camila Cooper

**ADDITIONAL RESOURCES:**

1. <https://www.edx.org/course/introduction-to-mongodb-using-the-mean-stack>
2. <https://www.simplilearn.com/full-stack-web-developer-mean-stack-certification-training>
3. <https://www.tutorialsteacher.com/nodejs/expressjs-web-application>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE09	ARTIFICIAL INTELLIGENCE						

**COURSE OBJECTIVE:**

The objectives of this course are

- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
- The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

**COURSE OUTCOMES:**

After completion of this course, the students would be able to

**CO 1:** Summarize the characteristics of AI that make it useful to real-world problems.

**CO 2:** Analyse different search techniques and predicate logic in artificial Intelligence.

**CO 3:** Interpret knowledge representation and symbolic reasoning using different rules.

**CO 4:** Apply the basic knowledge on learning.

**CO 5:** Make use of the power of AI in Natural language processing as an advanced application of AI.

**SYLLABUS****UNIT - I**

**Introduction to AI, Problems, Problem Spaces and Search:** Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

**UNIT - II**

**Heuristic Search Techniques:** Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. **Knowledge Representation Using Predicate Logic:** Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

**UNIT - III**

**Representing Knowledge Using Rules:** Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

**UNIT - IV**

**Weak slot-and-filler structures:** Semantic Nets, Frames, **Strong slot-and-filler structures:** Conceptual dependency, Scripts

**Learning:** Rote learning, learning by taking advice, learning in problem solving,

**UNIT - V**

**Natural Language Processing:** Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural language Processing, Spell Checking, **Parallel and Distributed AI:** Parallelism in Reasoning Systems, Distributed Reasoning Systems

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

### TEXT BOOKS:

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Edition, (Tata McGraw Hill Edition) Reprint 2008
2. Carl Townsend, 'Introduction to TURBO PROLOG', BPB Publications. 2011
3. Tom M Mitchell "Machine Learning "(McGraw-Hill Science/Engineering/Math; (March 1, 1997))

### REFERENCE BOOKS:

1. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education, 2003
2. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE10	OOPS THROUGH JAVA (OTHER THAN CSE AND ECE)						

**COURSE OBJECTIVE:**

The course provides fundamentals of object-oriented programming in Java and development of user interface.

**COURSE OUTCOMES:**

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

**CO1:** Summarize the basic concepts of Object Oriented Programming.

**CO2:** Illustrate various programming paradigms of Object Oriented Programming.

**CO3:** Analyse inheritance, packages and Exception handling concepts.

**CO4:** Apply multi-threading concepts and Applets.

**CO5:** Apply Event Handling and AWT concepts in various UI Applications.

**SYLLABUS:****UNIT - I**

**Introduction to OOP:** Introduction, Need of Object Oriented Programming, Principles of Object-Oriented Languages (Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features (Platform Independence, Object-Oriented, Both Java compiled and interpreted, Robust, Security, Multithreaded, other features), and Program structures, Installation of JDK1.8 (Getting started with JDK, JDK Installation notes, Exploring the JDK).

**UNIT - II**

**Programming Constructs:** Variables, Primitive Data types, Identifiers (Naming Conventions, Keywords), Literals, Operators (Binary, Unary and ternary), Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control (Branching, Conditional, loops).

**Classes and Objects:** classes, Objects, Creating Objects, Methods (method types, method overloading), constructors (Parameterized Constructors, Constructor overloading), Cleaning up unused objects (Garbage collector, Finalization), Static keyword (static variables, methods, blocks), this keyword, Arrays, Recursion, Command line arguments and String handling.

**UNIT - III**

**Inheritance:** Types of Inheritance, Deriving classes using extends keyword, Method overriding, super keyword, final keyword, Abstract class.

**Interfaces, Packages and Enumeration:** Interface (Variables in interface, Extending interface), Interface vs. Abstract classes, Packages (Creating packages, using Packages,

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Access protection), Understanding CLASSPATH, java. Lang package (Object class, String class), enumeration.

**Exceptions:** Introduction, Exception handling techniques (try...catch, throw, throws, finally block), user defined exception.

### **UNIT - IV**

**Multi-Threading:** java.lang.Thread, Thread life cycle, main Thread, Creation of new threads (by inheriting Thread class, Implementing the Runnable interface), Thread priority, Multithreading using is Alive () and join (), Synchronization (Synchronizing Methods, Statements), Suspending and Resuming threads, Communication between Threads.

**Applets:** Applet class, Applet structure, An Example Applet Program, Applet Life Cycle (in it (), start (), stop (), destroy ()), paint (), update () and repaint (), passing parameters to the Applet.

### **UNIT - V**

**Event Handling:** Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.

**Abstract Window Toolkit:** Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

### **TEXT BOOK:**

1. The Complete Reference Java, 8ed, Herbert Schildt, TMH.

### **REFERENCE BOOKS:**

1. JAVA Programming, K. Rajkumar, Pearson.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech.

### **ONLINE REFERENCES:**

1. <https://www.coursera.org/learn/object-oriented-java>
2. <https://www.youtube.com/watch?v=3u1fu6f8Hto>
3. <https://www.edx.org/course/object-oriented-programming-in-java>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDIT S
	4	0	0	40	60	100	03
Code : 19BCC5OE09	CLOUD COMPUTING						

**COURSE OBJECTIVES:**

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to:

**CO1:** Interpret various types of Virtualization.

**CO2:** Outline the Cloud Computing Architectures and Models.

**CO3:** Analyse the Cloud Infrastructure Management and Migration and Disaster Management in Cloud

**CO4:** Analyse AWS and MS Azure services.

**SYLLABUS****UNIT-I:**

**Overview of Cloud Computing:** Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

**UNIT-II:**

**Introduction to virtualization and virtual machine:** Types of virtualization: Server virtualization, Application/ desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.

**Cloud Computing Architecture:** Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

**UNIT-III:**

**Models of Cloud Computing:** Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, and Cloud Storage.

**UNIT-IV:**

**Cloud Infrastructure Management and Migration:** Administrating Clouds, Cloud Management

Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**Disaster Recovery:** Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

**UNIT-V:**

What is Microsoft Azure?, Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure. [What is AWS?](#), [History of AWS](#), [Important AWS Services](#) , Amazon Web Services Cloud Platform: Compute & Networking , Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management , [Applications of AWS](#) , [services](#), [Companies using AWS](#), [Advantages of AWS](#), [Disadvantages of AWS](#), [Comparison between Azure and AWS](#).

**TEXT BOOKS:**

1. Cloud Computing –Shailendra Singh Oxford University Press.

**REFERENCE BOOKS:**

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide  
[David S. Linthicum](#) Addison-Wesley Professional.
2. Distributed & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

**ONLINE REFERENCES:**

1. <http://nptel.ac.in/courses/106106129/21>
2. <https://freevidelectures.com/course/3649/cloud-computing>
3. [https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ\\_JwyA5IIOCdEWI NArFke4jgtlg](https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IIOCdEWI NArFke4jgtlg)

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC6OE10	BLOCKCHAIN TECHNOLOGIES						

**COURSE OBJECTIVES:**

- Introduces the fundamental concepts and functionalities of Block chain.
- Provide conceptual understanding of methods in securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

**COURSE OUTCOMES:**

Upon the completion of the course, the students will be able to:

**CO 1:** Understand the fundamentals of Block chain.

**CO 2:** Analyse the working of Block chain.

**CO 3:** Understand how business can be easily made with Block chain.

**CO 4:** Understand how Block Chain can be integrated with various current technologies.

**CO 5:** Get familiarity about the Block chain strength in providing solutions.

**CO 6:** Investigate and understand the Problems with Block chain.

**SYLLABUS:****UNIT I:**

Grasping Block chain Fundamentals:

Tracing Block chain's Origin, The shortcomings of current transaction systems, The emergence of bit coin, The birth of block chain, Revolutionizing the Traditional Business Network, Exploring a block chain application, Recognizing the key business benefits, Building trust with block chain.

**UNIT II:**

Taking a Look at How Block chain Works:

Why It's Called "Block chain", What Makes a Block chain Suitable for Business?, Shared ledger, Permissions, Consensus, Smart contracts ,Identifying Participants and Their Roles.

**UNIT III:**

Propelling Business with Block chains:

Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business Networks, Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

**UNIT IV:**

Block chain in Action: Use Cases:

Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government, Supply Chain Management, Healthcare, Electronic medical records Healthcare payments preauthorization.

**UNIT V**

Hyper ledger, a Linux Foundation Project:

Hyper ledger Vision, Hyper ledger Fabric, How Can IBM Help Developers Innovate With Block chain? Offering an easily accessible cloud and development platform, Individualized attention and industry

Expertise.

**UNIT VI:**

Problems with Block chain:

Security and Safeguards, Protection from attackers, Hacks on exchanges, what is stopping adoption? Scalability problems, Network attacks to destroy bit coin, Case Study: Failed currencies & block chain

**TEXT BOOK:**

1. Block chain For Dummies®, IBM Limited Edition, Manav Gupta, John Wiley & Sons, Inc.111 River St, Hoboken, NJ 07030-5774

**REFERENCES:**

1. Swan, Melanie. Block chain: Blueprint for a new economy. "O'Reilly Media, Inc.", 2015.
2. Gupta, M. "Block chain For Dummies." (2017).

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE -IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
<b>Code: 19BCC7OE09</b>	<b>CYBER SECURITY</b>						

**COURSE OBJECTIVES:**

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

**COURSE OUTCOMES:**

- C01. Cyber Security architecture principles
- C02. Identifying System and application security threats and vulnerabilities
- C03. Identifying different classes of attacks
- C04. Cyber Security incidents to apply appropriate response
- C05. Describing risk management processes and practices
- C06. Evaluation of decision making outcomes of Cyber Security scenarios

**SYLLABUS****UNIT- I**

Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

**UNIT –II**

Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT –III**

Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft(ID Theft)

**UNIT –IV**

Cybercrimes and Cyber security:

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

**UNIT –V**

Understanding Computer Forensics:

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Ant forensics.

**TEXT BOOKS:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina God bole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

**REFERENCE BOOK:**

1. Information Security, Mark Rhodes, Ousley, MGH.

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

OPEN ELECTIVE - IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code: 19BCC7OE10</b>	<b>ETHICAL HACKING</b>						

**COURSE OBJECTIVES:**

- To develop ability to quantitatively assess and measure threats to information assets
- Evaluate where information networks are most vulnerable and perform penetration tests into secure networks for evaluation purposes
- Critique security plans designed at protecting data assets against attacks from the Internet and investigate and mitigate data risk

**COURSE OUTCOMES:**

After completion of this course, the students would be able to:

**CO1:** Classify the elements of information security and its challenges and role of security and penetration testing

[K2]

**CO2:** Analyse different attacks and hacking methods [K4]

**CO3:** Exemplify different techniques in hacking [K2]

**CO4:** Apply Ethical hacking techniques and understand the Ethical Hacking Laws [K3]

**SYLLABUS:**

**UNIT - I:**

**ETHICAL HACKING:** Types of Data Stolen, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Types of Hackers, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

**UNIT - II:**

**FOOT PRINTING AND SOCIAL ENGINEERING:** Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking.

**UNIT - III:**

**DATA SECURITY & FIREWALLS:** Physical Security – Attacks and Protection, A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks, Attacks and Measures, Wireless Hacking, Windows Hacking, Linux Hacking.

**UNIT - IV:**

**NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS:** Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer

---

## **SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.

### **UNIT - V:**

**ETHICAL HACKING LAWS AND TESTS** : An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

### **TEXT BOOKS:**

1. Michael T. Simpson, Kent Backman, James E. “Corley, Hands-On Ethical Hacking and Network Defense”, Second Edition, CENGAGE Learning, 2010.
2. Kenneth C.Brancik, “Insider Computer Fraud”, Auerbach Publications Taylor & Francis, Group 2008.
3. Ankit Fadia, “Ethical Hacking”, Second Edition Macmillan India Ltd, 2006.

### **REFERENCE BOOKS:**

1. Steven DeFino, Barry Kaufman, Nick Valenteen, “Official Certified Ethical Hacker Review Guide”, CENGAGE Learning, 2009-11-01.
2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series –Elsevier, August 4, 2011. Whitaker & Newman, “Penetration Testing and Network Defence”, Cisco Press, Indianapolis, IN, 2006.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

**LIST OF OPEN ELECTIVES OFFERED BY INFORMATION TECHNOLOGY  
DEPARTMENT****OPEN ELECTIVE-I**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	Front End UI and Frame Work	IT	19BCC4OE11	3	0	0	3
2	Front End Web Technologies	IT	19BCC4OE12	3	0	0	3

**OPEN ELECTIVE-II**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	Object Oriented Programming through C++	IT	19BCC5OE11	3	0	0	3
2	Cloud Computing	IT	19BCC5OE12	3	0	0	3

**OPEN ELECTIVE-III**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	Digital Marketing	IT	19BCC6OE11	3	0	0	3
2	DevOps	IT	19BCC6OE12	3	0	0	3

**OPEN ELECTIVE-IV**

S.NO	SUBJECT TITLE	DEPARTMENT	SUB CODE	NO.OF PERIODS PER WEEK			NO.OF CREDITS
				L	T	P	
1	Human Computer Interaction	IT	19BCC7OE11	3	0	0	3
2	E-Commerce	IT	19BCC7OE12	3	0	0	3

**OPEN ELECTIVE-I**

<b>OPEN ELECTIVE -I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>INTERNAL MARKS</b>	<b>EXTERNAL MARKS</b>	<b>TOTAL MARKS</b>	<b>CREDITS</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
<b>Code: 19BCC4OE11</b>	<b>FRONT END UI AND FRAMEWORK</b>						

**COURSE OBJECTIVE:**

- To gain the knowledge of techniques associated with the World Wide Web.
- To understand how to use Web-based media-rich programming tools for creating interactive web pages.

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to:

**CO 1:** Analyze a web page and identify its elements and attributes of HTML5.

**CO 2:** Apply Cascading Styles sheets to design web pages.

**CO 3:** Build dynamic web pages using Java Script.

**CO 4:** Build interactive web pages with jQuery.

**SYLLABUS:****UNIT - I**

HTML5 Basic Tags, Text Formatted Tags, Lists, Tables, Images, Colors, Forms, HTML5 Canvas, HTML5 SVG, HTML5 Media.

**UNIT - II**

Cascading Style Sheets: Styling Text, Color, Background, Images, Styling Links, Understanding the CSS Box Model and Positioning, Creating Fixed or Liquid Layouts, Using CSS to Design Navigation.

**UNIT - III**

Introduction to Java Script: General Syntactic Characteristics, Primitives, Control Statements. Objects in Java Script, Dynamic HTML with Java Script: Positioning elements, Moving Elements. Regular Expressions in Java Script: Pattern matching using regular expressions, Working with Events: on load, on click, on submit, on mouse over, on mouse out, on key down, on key up, on key press.

**UNIT - IV**

jQuery API: Introduction: What jQuery can Do, Who Develops jQuery? Obtaining jQuery Programming Conventions, Markup and CSS Conventions, JavaScript Conventions. Events: The Various Event Wrapper Methods, Attaching Other Events, Attaching Persistent Event Handlers, Removing Event Handlers. Manipulating Content

---

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

---

and Attributes:Setting, Retrieving, and Removing Attributes, Manipulating HTML and Text Content. Iteration of Arrays and objects: Enumerating Arrays, Filtering Selections and Arrays, Mapping a Selection or an Array, Array Utility Methods.

### UNIT - V

JQuery UI: Animations and Effects: Showing and Hiding Elements, Sliding Elements, Fading Elements, Custom Animation, And Animation Options. HTML5 Drag and Drop: Implementing Drag and Drop. Sortable: Making a List Sortable, Customizing Sortable, Saving the State of Sorted Lists. Date picker: Implementing a Date picker, localizing the Date picker

### TEXT BOOKS:

1. Kogent leaning solutions Inc, “Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book”, ISBN: 978-93-5004-593-0,Dream Tech,2013.
2. Robert W Sebesta,” Programming the World Wide Web”, ISBN 10:1-292-02431-3, Pearson, 7<sup>th</sup> edition,2014.
3. Richard York, “Web Development with JQuery”, ISBN:978-1-118-86607-8, John Wiley & Sons,2<sup>nd</sup> Edition,2015.

### REFERENCE BOOKS:

1. Paul S Wang, Sanda S Katila, “An Introduction to Web Design, Programming”, ISBN- 10: 8131503674, Cengage,2012.
2. Uttam K Roy “Web Technologies”, ISBN-10: 9780198066224, Oxford,2010.

### ONLINE REFERENCES:

1. <https://www.edx.org/course/html5-css-fundamentals-w3cx-html5-0x-0>
2. <https://freevideolectures.com/course/3196/jquery>
3. <https://www.edx.org/course/introduction-to-jquery>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	03
Code : 19BCC4OE12	FRONT END WEB TECHNOLOGIES						

**COURSE OBJECTIVE:**

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

**COURSE OUTCOMES:**

After completion of this course, the students would be able to

**CO1:** Interpret a webpage and identify its elements and attributes. – (K2)

**CO2:** Develop webpages using HTML5. – (K3)

**CO3:** Make use of Cascading Style Sheets on

webpages – (K3) **CO4:** Experiment with Interactive

webpages using JavaScript – (K3) **CO5:** Build dynamic

webpages with JQuery. – (K3)

**CO6:** Make use of JQuery UI on dynamic webpages. – (K3)

**SYLLABUS:****UNIT I:**

**HTML5:** Fundamentals of HTML, working with text, organizing text in HTML, working with Links and URLs, creating tables, working with Images, Colors and Canvas, working with Forms, interactive elements, working with Multimedia

**UNIT II:**

**Cascading Style Sheets:** Overview of CSS3, backgrounds and color gradients in CSS, fonts and text styles, creating boxes and columns using CSS. Displaying, positioning and floating an element, list styles, table layouts, pseudo-classes and pseudo-elements. Effects, frames and controls in CSS, Implementing the advanced features of HTML5

**UNIT – III**

**Introduction to JavaScript:** General syntactic characteristics, primitives, operations, expressions and Control Statements. **Objects in JavaScript:** Object creation and modification, Arrays, Functions.

**Dynamic HTML with JavaScript:** Positioning elements, moving elements, element visibility, changing colours and fonts, dynamic content. **Regular Expressions in JavaScript:** Pattern matching using regular expressions. **Working with Events:** on load, on click, on submit, on mouse over, on mouse out, on key down, on key up and on key press.

## **UNIT - IV**

### **JQuery API:**

**Introduction:** What jQuery can Do, Who Develops jQuery? Obtaining jQuery, Installing jQuery, programming conventions, markup and CSS conventions, JavaScript conventions. **Selecting and Filtering Elements:** Using the selectors API, filtering a selection, working within the context of a selection, working with an element's relatives, slicing a selection, adding to a selection. **Events:** The various event wrapper methods, attaching other events, attaching persistent event handlers, removing event Handlers, creating custom events.

## **UNIT - V**

**JQuery UI: HTML5 Drag and Drop:** Implementing Drag and Drop, Implementing Drag-and-Drop File Uploads, **Sortable:** Making a List Sortable, Customizing Sortable, Saving the State of Sorted Lists, **Selectable, Accordion:** Building an Accordion UI, Changing the Default Pane, Changing the Accordion Event, Setting the Header Elements, **Date picker:** Implementing a Date picker, Localizing the Date picker, **Dialogue:** Implementing a Dialog, Styling a Dialog, Making a Modal Dialog, Auto-Opening the Dialog, Controlling Dynamic Interaction, Animating the Dialog, Working with Dialog Events.

### **TEXT BOOKS:**

1. HTML 5 Black book, Dream Tech.,2011, (Unit I,II,III).
2. Uttam K Roy, "Web Technologies",Oxford,2010 (Unit IV).
3. Richard York , Web Development with JQuery, Wiley publications, 2/e ,2015(Unit VI)

### **REFERENCE BOOKS:**

1. Robert W Sebesta, "Programming the World Wide Web", 7ed, Pearson, 2012
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design, Programming", Cengage, 2003.

### **ADDITIONAL RESOURCES:**

1. <https://www.w3schools.com/>
2. [nptel.ac.in/courses/106105084/13](https://nptel.ac.in/courses/106105084/13)
3. <https://www.coursera.org>
4. Learning Management System.

**OPEN ELECTIVE-II**

OPEN ELECTIVE - II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE11	OBJECT ORIENTED PROGRAMMING THROUGH C++						

**COURSE OBJECTIVES:**

- Explain the basics of Object Oriented Programming concepts.
- Apply the object initialization and destroy concept using constructors and destructors.
- Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
- Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
- Use I/O operations with functions in programs.
- Use Exceptional Handling programs

**COURSE OUTCOMES:**

After successful completion of this course, students will be able to:

CO1: Compare and Contract of Procedural and Object Oriented Programming concepts.

CO2: Apply the object initialization and destroy concept using constructors and destructors.

CO3: Apply virtual and pure virtual function & complex programming situations

CO4: Apply the concept of Inheritance, polymorphism, abstract class in programs.

CO5: Demonstrate the usage of Exceptional Handling with programs

**SYLLABUS:**

**UNIT-I: Introduction to C++:** Difference between C and C++, Disadvantage of Conventional Programming, Features of Object-Oriented Programming, Advantage of OOPS, Tokens, Keywords, Identifiers, Data Types, Type Compatibility, Variables, Input / Output Statements, Operators in C++, Implicit Conversions, Control Structures.

**UNIT-II: Classes Objects & Constructors and Destructor:** Creating Classes in C++, Creating Objects, Access Specifiers and their Scope, Nested class, Constructors, Constructor with Arguments (parameterized Constructor-Destructors, Overloading Constructors), and Destructors, Copy Constructor, Dynamic Constructor, Defining Operator Overloading

---

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

---

**UNIT–III : Functions and Pointers:** Functions, Inline function, function overloading, friend and virtual functions( Virtual and pure virtual functions), Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- this Pointer- Pointer to Derived Classes and Base Class,

**UNIT–IV:** Inheritance and Polymorphism in C++, Defining Inheritance, Types of Inheritance (Single, Multiple, Multilevel, Hierarchal), Polymorphism, Types of Polymorphism Abstract classes.

File input and output: Reading a File, Managing I/O Streams, Opening a File – Different Methods.

**UNIT–V:** Exception handling: Throwing an exception, catching an exception: The try block, Exception handlers, Exception specification, rethrowing an exception, uncaught exceptions, and Standard exceptions.

### TEXT BOOKS:

1. Object Oriented Programming using C++, Alok Kumar Jagadev, Amiya Kumar, Rath Satchidananda Dehuri , 2007 Edition.
2. Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013.
3. Object-Oriented Programming with ANSI and Turbo C++ Ashok Kamnthe, Pearson Education, 7<sup>th</sup> Edition.

### REFERENCE BOOKS:

1. Object Oriented Programming using C++, Robert Lafore, Galgotia publication 2010.

### ONLINE REFERENCES:

1. <https://www.youtube.com/watch?v=xnh7ip5gpzc&list=PLfVsf4Bjg79DLA5K3GLbIwf3baNVFO2Lq>
2. <https://www.youtube.com/watch?v=CyTsm0sUgi4&list=PLfVsf4Bjg79DLA5K3GLbIwf3baNVFO2Lq&index=6>

---

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

---

OPEN ELECTIVE -II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE12	<b>CLOUD COMPUTING</b>						

**COURSE OBJECTIVES:**

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to:

**CO1:** Interpret various types of Virtualization.

**CO2:** Outline the Cloud Computing Architectures and Models.

**CO3:** Analyze the Cloud Infrastructure Management and Migration and Disaster Management in Cloud

**CO4:** Analyze AWS and MS Azure services.

**SYLLABUS**

**UNIT-I:**

**Overview of Cloud Computing:** Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

**UNIT-II:**

**Introduction to virtualization and virtual machine:** Types of virtualization: Server virtualization, Application/ desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.

**Cloud Computing Architecture:** Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

**UNIT-III:**

**Models of Cloud Computing:** Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage.

**UNIT-IV:**

**Cloud Infrastructure Management and Migration:** Administrating Clouds, Cloud Management Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.

**Disaster Recovery:** Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

**UNIT-V:**

What is Microsoft Azure?, Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure. [What is AWS?](#), [History of AWS](#), [Important AWS Services](#) , Amazon Web Services Cloud Platform: Compute & Networking , Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management , [Applications of AWS ,services](#), [Companies using AWS](#), [Advantages of AWS](#), [Disadvantages of AWS](#), [Comparison between Azure and AWS](#).

**TEXT BOOKS:**

1. Cloud Computing –Shailendra Singh Oxford University Press.

**REFERENCE BOOKS:**

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide [David S. Linthicum](#) Addison-Wesley Professional.
2. Distributed & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

**ONLINE REFERENCES:**

1. <http://nptel.ac.in/courses/106106129/21>
2. <https://freevideolectures.com/course/3649/cloud-computing>
3. [https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ\\_JwyA5IIOCdEWI NArFke4jgtlg](https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IIOCdEWI NArFke4jgtlg)

**OPEN ELECTIVE-III**

OPEN ELECTIVE - III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code : 19BCC6OE11</b>	<b>DIGITAL MARKETING</b>						

**COURSE OUTCOME:**

At the end of the course, student will be able to

**CO1:** Develop insight on Current Trends – Digital and Social Statistics (Info graphics)

**CO2:** Analyze the Digital Marketing Platforms like Facebook, Twitter, and YouTube etc.

**CO3:** Analyze the basics of Search Engine Optimization (SEO) and Mobile Marketing

**CO4:** Design the various strategies involved in Marketing products and Services Digitally.

**UNIT 1: Introduction to Digital Marketing-** Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.

**UNIT 2: Internet Marketing and Digital Marketing Mix –** Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC

**Search Engine Advertising:** - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation

**Display marketing:** Types of Display Ads, Buying Models, Programmable Digital Marketing, Analytical Tools, YouTube marketing

**UNIT 3: Social Media Marketing – Role of Influencer Marketing, Tools & Plan–**

Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy

**Facebook Marketing:** Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools

**LinkedIn Marketing:** Introduction and Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting

**UNIT 4:**

**Twitter Marketing:** Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns

**Instagram and Snap chat:** Digital Marketing Strategies through Instagram and Snap chat

**Mobile Marketing:** Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics

**UNIT 5: Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in**

---

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

---

**Digital Advertising** Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics, Introduction to SEM

**Web Analytics:** Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universalanalytics, Tracking code, **Trends in digital advertising.**

### TEXT BOOKS:

1. Seema Gupta, Digital Marketing, Mc-Graw Hill, 1<sup>st</sup> Edition- 2017
2. Ian Dodson, The Art of Digital Marketing, Wiley Latest Edition
3. Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson, 1<sup>st</sup> Edition – 2017

### REFERENCE BOOKS:

1. Vandana Ahuja, Digital Marketing, Oxford University Press, Latest Edition
2. Philip Kotler, Marketing 4.0: – Moving from Traditional to Digital, Wiley 2017
3. Melissa S. Barker |Donald I. Barker | Nicholas F. Bormann | Debra Zahay | Mary Lou Roberts, Social Media Marketing: A Strategic Approach, Cengage Latest Edition
4. Ward Hanson , Kirthi Kaly anam, Internet Marketing & e- Commerce Cengage Latest Edition

### WEB REFERENCES:

- 1 <https://learndigital.withgoogle.com/digitalunlocked/>
- 2 <https://digitalskills.fb.com/en-in/>
- 3 <https://www.hubspot.com/digital-marketing>
- 4 <http://www.afaqs.com/>
- 5 <https://www.linkedin.com/learning/>

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE -III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC6OE12	DEVOPS						

**COURSE OBJECTIVES:**

DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

**COURSE OUTCOMES (COS):**

At the end of the course, student will be able to

**CO 1:** Demonstrate the phases of software development life cycle

**CO 2:** Outline the basic Fundamentals of DevOps

**CO 3:** Adopt the DevOps technology into the project

**CO 4:** Evaluate the CI/CD concepts and metrics to track CI/CD practices

**CO 5:** Summarize the importance of DevOps maturity models

**UNIT I:**

Phases of Software Development life cycle. Values and principles of agile software development.

**UNIT II:**

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

**UNIT III:**

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack Implementation, People aspect, processes

**UNIT IV:**

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

**UNIT V:**

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model,

**UNIT VI:**

DevOps maturity Assessment, The Internet of things and Devops

**TEXT BOOKS:**

1. The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by Gene Kim , John Willis , Patrick Debois , Jez Humb,O'Reilly Publications
2. What is Devops? Infrastructure as code By in Mike Loukides ,O'Reilly publications.
3. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, by Jez Humble and David Farley
4. Achieving DevOps: A Novel about Delivering the Best of Agile, DevOps, and Micro services by Dave Harrison, Knox Lively
5. Practical Devops: By Joakim Verona , Packt

**REFERENCE BOOKS:**

1. Building a DevOps Culture by Mandi Walls, O'Reilly publications
2. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline with Containerized Micro services by Viktor Farcic

**OPEN ELECTIVE-IV**

OPEN ELECTIVE - IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code:19BCC7OE11</b>	<b>HUMAN COMPUTER INTERACTION</b>						

**COURSE OBJECTIVES:**

- The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

**COURSE OUTCOMES:**

- CO1. Outline knowledge about user interface design.
- CO2. Summarize the importance of Graphical User Interface.
- CO3. Apply the strategies used in design process.
- CO4. Summarize the importance of screen designing.
- CO5. Apply the various operations of Windows.

**UNIT - I**

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

**UNIT - II**

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

**UNIT - III**

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds.

**UNIT – IV**

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics.

**UNIT - V**

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colours, uses problems, choosing colours.

**TEXT BOOKS:**

1. Human Computer Interaction. 3/e, Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, PEA,2004.
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

**REFERENCE BOOKS:**

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, Soren Lauesen , PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE - IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
<b>Code:19BCC7OE12</b>	<b>E - COMMERCE</b>						

**COURSE OBJECTIVES:**

- To introduce the fundamental principles of e-business, e-commerce, and the role of management.
- To introduce the application of tools and services to the development of small-scale e-commerce applications

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to:

**CO 1:** Interpret the E-commerce applications and Process Model. [K2]

**CO 2:** Compare and contrast various electronic Payment Systems. [K3]

**CO 3:** Interpret the Intra Organizational Commerce. [K2]

**CO 4:** Outline the corporate digital library and marketing research. [K2]

**CO 5:** Analyze resource discovery and information filtering. [K4]

**SYLLABUS:****UNIT – I**

Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

**UNIT – II**

Consumer Oriented Electronic commerce - Mercantile Process models.

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

**UNIT – III**

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

**UNIT – IV**

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.

Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

**UNIT – V**

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Digital Video and electronic Commerce

**TEXT BOOKS :**

1. Kalakata, Whinston, “Frontiers of electronic commerce”, Pearson.

**REFERENCE BOOKS :**

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, “E-Commerce fundamentals and applications”
2. S.Jaiswal – Galgotia, “E-Commerce”.
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, “E-Commerce”.
4. Gary P.Schneider, “Electronic Commerce”, Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

**WEB REFERENCES:**

1. <https://www.slideshare.net/kamalgulati7/full-notes-on-ecommerce-study-material-for-ecommerce>
2. [http://www.vssut.ac.in/lecture\\_notes/lecture1428551057.pdf](http://www.vssut.ac.in/lecture_notes/lecture1428551057.pdf)
3. <https://www.geektonight.com/e-commerce-notes/>

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19****LIST OF OPEN ELECTIVES OFFERED BY MASTER OF BUSINESS ADMINISTRATION DEPARTMENT****OPEN ELECTIVE-I**

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Financial Institutions, Markets and Services	MBA	19BCC4OE13	3	0	0	3
2	Human Resource Practices	MBA	19BCC4OE14	3	0	0	3

**Open Elective-II**

S.No.	Open Elective-II Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Digital Marketing	MBA	19BCC5OE13	3	0	0	3
2	Personal Finance Planning	MBA	19BCC5OE14	3	0	0	3

**Open Elective-III**

S.No.	Open Elective-III Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Performance Management	MBA	19BCC6OE13	3	0	0	3
2	Services Marketing	MBA	19BCC6OE14	3	0	0	3

**Open Elective-IV**

S.No.	Open Elective-IV Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Quality Management	MBA	19BCC7OE13	3	0	0	3
2	Logistics and Supply Chain Management	MBA	19BCC7OE14	3	0	0	3

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

<b>OPEN ELECTIVE-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>INTERNAL MARKS</b>	<b>EXTERNAL MARKS</b>	<b>TOTAL MARKS</b>	<b>CREDITS</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>03</b>
<b>Code:19BCC4OE13</b>	<b>Financial Institutions, Markets and Services</b>						

**COURSE OUTCOMES: The student is able to**

CO1: Explain the financial system in economic development of a nation. [K5]

CO2: Evaluate Banking and Non – Banking Institutions. [K5]

CO3: Analyse differentiated markets and generalize the importance of major and minor markets in Indian industry with SEBI functions. [K4]

CO4: Creating of Knowledge about fund based services in India. [K6]

CO5: Creating of Knowledge about fee - based services in India. [K6]

**SYLLABUS:****UNIT –I: INTRODUCTION TO FINANCIAL SYSTEM**

Elements of financial system and economic development, Regulatory and Promotional Institutions - Function and Role of RBI, Monetary Policy and techniques of RBI,

**UNIT –II: THE BANKING &NON-BANKING INSTITUTIONS**

The public and the private sectors – structure and comparative performance, Bank capital and Banking Innovations, Commercial and Co-operative banks. The Non-banking financial Institutions - Mutual Funds, Growth of Indian Mutual funds and its Regulation. The Role of AMFI, Insurance Companies- Role of IRDA.

**UNIT–III: FINANCIAL MARKETS**

Primary and Secondary Markets, Structure and functions of Money Market, -Call money market ,Government Securities Market – T-bills market, Commercial Bills market, Commercial paper and certificate of deposits. Securities markets: - Organization and structure, listing trading and settlement of securities market,, The role and functions of SEBI

**UNIT–IV: FUND BASED SERVICES**

Lease and hire purchase consumer credit and Factoring - Definition, Functions, Advantages, Evaluation, venture capital financing, Housing Finance.

**UNIT–V: FEE-BASED SERVICES**

Stock broking, credit rating Merchant Banking, portfolio services. Underwriting, Depository services, Challenges faced by investment bankers.

**Text Books:**

1. Financial Institutions and Markets, L. M. Bhole, 4/e Tata McGraw Hill.
2. Financial services, Gordon & Natarajan, Himalaya publishers.

**References:**

1. Financial Services and markets, Dr.Punithavathy Pandian, Vikas
2. Financial Markets and services, Appannaiah, Reddy and Sharma, HPH
3. Indian Financial System, Ramachandra and others, HPH
4. Investment Institutions and Markets, Jeff Madura, Cengage, 1<sup>st</sup> Edition.
5. Financial services, Thirpati, PHI.
6. Financial Markets & Services, Vasanth desai, Himalaya.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

<b>OPEN ELECTIVE-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>INTERNAL MARKS</b>	<b>EXTERNAL MARKS</b>	<b>TOTAL MARKS</b>	<b>CREDITS</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>03</b>
<b>Code:19BCC4OE14</b>	<b>Human Resource Practices</b>						

**COURSE OBJECTIVES: The student is able to**

CO1: Understand the role of HRM at global perspective. [K2]

CO2: Choose the methods of Recruitment & Selection. [K3]

CO3: Understand the various methods of performance appraisal. [K2]

CO4: Identify the determinants of payment of wages and welfare facilities. [K3]

CO5: Select the Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms. [K3]

**SYLLABUS:****UNIT -1: INTRODUCTION TO HRM**

Introduction to HRM– Definition & functions – Evolution of HRM – Principles of HRM – Ethical aspects of HRM – Role of Position of HRM. – HRM at global perspective – differences between PM & HRM- Challenges of HRM.

**UNIT-2: INVESTMENT PERSPECTIVES OF HRM**

Investment Perspectives of HRM- HR Planning – Recruitment & Selection – Sources of Recruitment, Selection Procedure – Selection tests – Interview Techniques.

**UNIT-3: PERFORMANCE EVALUATION**

Job Analysis & Design- Job Analysis- Process of Job analysis – Job description and Job Specification –Training and development- Training methods- Performance Appraisal – Traditional and Modern methods of PA.

**UNIT-4: WAGE & WELFARE MANAGEMENT**

Wage & Welfare Management- Concept of Wage – Wage Structure –Welfare Management: Nature and Concepts – Statutory and Non-statutory welfare measures.

**UNIT-5: GRIEVANCE HANDLING**

Grievance handling- Collective bargaining –Industrial Disputes Resolution Mechanisms – Statutory provisions of Industrial safety.

**TEXT BOOKS:**

1. K Aswathappa: “*Human Resource and Personnel Management*”, Tata McGraw Hill, New Delhi, 2013
2. SubbaRao P: “*Personnel and Human Resource Management-Text and Cases*”, Himalaya Publications, Mumbai, 2013.

**REFERENCES:**

1. N.SambasivaRao and Dr.Nirmal Kumar: “*Human ResourceManagement and Industrial Relations*”, Himalaya PublishingHouse, Mumbai
2. Mathis, Jackson, Tripathy: “*Human Resource Management: A South-Asian Perspective*”, Cengage Learning, New Delhi, 2013
3. MadhurimaLall, SakinaQasimZasidi: “*Human ResourceManagement*”, Excel Books, New Delhi, 2010
4. Muller\_Camen. Croucher and Leigh: “*Human ResourceManagement- A Case Study Approach*”, JAICO Publishing, Delhi.
5. S.Seetharaman, B.VenkateswaraPrasad: “*Human ResourceManagement*”, SCITECH Publication (India) Limited, Hyderabad, 2009.
6. Gary Dessler, BijuVrkkey: “*Human Resource Management*”, Pearson Education, New Delhi, 2011
7. Uday Kumar Haldar: “*Human Resource Development*”, Oxford University Press, New Delhi, 2012.
8. NarendarSingh: “*Human Resource Management*”, Universities Press (India) Private Limited, Hyderabad, 2011.
9. B.B.Mahapatro: “*Human Resource Management*”, New Age International Publishers, New Delhi, 2011
10. R.S.Dwivedi: “*Human Relations and Organisational Behaviour*”, MacMillan Business Books, New Delhi, 2013.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE13	DIGITAL MARKETING						

**COURSE OUTCOMES: The student is able to**

CO1: Outline the basic concepts of Digital Marketing. [K2]

CO2: Analyze different channels of digital marketing according to the changing requirements of the markets. [K4]

CO3: Construct different digital marketing plans on situational basis.

CO4: Improve marketing through search engine and online advertising (K6)

CO5: Compare different avenues of social media for marketing and advertising products for effective sales. [K4]

**SYLLABUS:****UNIT - I: INTRODUCTION TO DIGITAL MARKETING**

Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends. How different segments use Digital Media

**UNIT - II: CHANNELS OF DIGITAL MARKETING**

Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Mobile Marketing,

**UNIT - III: DIGITAL MARKETING PLAN**

Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

**UNIT - IV: SEARCH ENGINE MARKETING AND ONLINE ADVERTISING**

Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPT [Cost-per-Thousand] and CPC [Cost-per-click], Display Ads - choosing a Display Ad Format, Landing Page and its importance.

**UNIT - V: SOCIAL MEDIA MARKETING**

Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, and Micro blogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

**TEXT BOOKS:**

1. Dave Evans., Susan Bratton, [2008]. Social Media Marketing: An Hour a Day. ,2nd edition, Wiley
2. Dave Evans., Susan Bratton, [2010]. Social Media Marketing: The Next Generation of Business Engagement. Wiley
3. Your Google Game Plan for Success: Increasing Your Web Presence with Google AdWords, Analytics and Website Optimizer, Joe Teixeira, Wiley 2010
4. Michael Miller, B2B Digital Marketing, 1e, Pearson, 2014.

**REFERENCE BOOKS:**

1. Vandana Ahuja, Digital marketing, Oxford University Press 2015.
2. Michael R Solomon, Tracy Tuten, Social Media Marketing, Pearson, 1e, 2015.
3. Judy Strauss & Raymond Frost, E-Marketing, Pearson, 2016.
4. Richard Gay, Alan Charles worth and Rita Esen, Online marketing – A customer led approach Oxford University Press 2007.
5. Arup Varma, Pawan S. Budhwar, Angelo S. De Nisi, Digital Marketing, Wiley, 2016.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE14	PERSONAL FINANCIAL PLANNING						

**COURSE OUTCOMES: The student is able to**

CO1: List out steps in financial planning process [K4].

CO2: design the process for preparation and filing of tax returns [K6].

CO3: Evaluate investment decisions in capital goods [K5].

CO4: Analyse various insurance policies which are suitable for investor needs [K4].

CO5: Evaluate alternate investment options [K5].

**SYLLABUS:****UNIT-I: UNDERSTANDING THE FINANCIAL PLANNING PROCESS**

The rewards of sound financial planning – planning for a life time- the planning environment – determinants of personal income-financial statements and plans –mapping the financial future-time value of money- preparing personal income statement and balance sheet-making cash budgets.

**UNIT-II: MANAGING TAXES**

Principals of income taxes- computation of salary, Rental income& Capital Gains, Other Income filing returns-tax planning-other forms of personal taxes-provisions Of Wealth Tax Act& Computations of Net Wealth & Wealth Tax.

**UNIT-III: MAKING DECISIONS REGARDING PURCHASE OF AUTOMOBILES AND HOUSES**

Deciding whether to lease or buy-finding an affordable house-the house buying process-housing finance. Managing credit- opening an overdraft account-using credit carefully-consumer loans.

**UNIT-IV: MANAGING INSURANCE NEEDS**

Basic insurance concepts-deciding on the amount of life insurance required-key features of life insurance policies-buying life insurance –types and sources of health insurance plans- principles of property insurance-automobile insurance- other types of insurance;

**UNIT-V: ALTERNATIVE INVESTMENT OPTIONS**

Art, Gold, Antiques, commodities, real Estate, REITS, Real Estate Related Mutual Funds, Charity, Investments outside India. Retirement Planning- Estimating need at retirement –Social Security-pension plans and retirement plans –annuities, Reserve Mortgage.

**TEXT BOOKS:**

1. Personal Financial Planning, ICFAI Publications
2. Personal Financial Planning, 11th e Gitman, Lawrence J/Joehnk, Michael D. South Western College Pub. 2007.
3. Personal Financial Planning Guide, 5th e Ernst and Young's Wiley2004.

**REFERENCE BOOKS:**

1. Personal Financial Planning.7<sup>th</sup>e Hallman, G Victor/ Rosenbloom, Jerry S. McGraw Hill 2010.
2. Personal Investment and Tax Planning Year Book Yasasway, N J Vision Publication Edition 2010-11
3. Income Tax Law & Practice, 35th e Gaur, V.P / Narang, D.B Kalyani Publishers 2011.
4. Personal Financial Planning.7<sup>th</sup>e Hallman, G Victor/ Rosenbloom, Jerry S. McGraw Hill2010.
5. Personal Investment and Tax Planning Year Book Yasasway, N J Vision Publication Edition 2010-11
6. Income Tax Law & Practice, 35th e Gaur, V.P / Narang, D.B Kalyani Publishers 2011.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE13	PERFORMANCE MANAGEMENT						

**COURSE OUTCOMES: The student is able to**

CO1: Adapt the basics of performance management system. [K6]

CO2: Identify the performance system best fit to organization. [K3]

CO3: Develop a mechanism to meet the performance expectations set by the organization. [K6]

CO4: Apply the monitoring principles. [K3]

CO5: Analyze performance appraisal system and determining the best system of appraisal for the needs of the organization. [K4]

**SYLLABUS:****UNIT-I: INTRODUCTION**

Definition, concerns and scope – Historical developments in performance Management – Performance Appraisal Vs. Performance Management - Performance Management Vs. Human Resource Management – Implications of Performance Management.

**UNIT-II: PERFORMANCE THEATRE**

Performance System – Performance Theatre - planning Manage performance and Development, Monitoring Manage performance & Mentoring Manage Development.

**UNIT-III: PLANNING FOR MANAGEE'S PERFORMANCE AND DEVELOPMENT**

Setting Objectives – Organizational and Individual Performance plans – Components of Manage Performance and development plan – Setting mutual expectations and performance criteria.

**UNIT-IV: MONITORING AND MENTORING**

Introduction – Supervision – Objectives and Principles of Monitoring – Monitoring Process – Periodic reviews – Problem solving – Engendering trust.

**UNIT-V: APPRAISING FOR RECOGNITION AND REWARD**

Purpose of Appraising – Methods of Appraisal – Appraisal system design – Implementing the Appraisal system – Appraisals and HR decisions.

**TEXT BOOKS:**

1. Performance Management: Prem Chadha: Macmillan India, New Delhi, 2006.

**REFERENCE BOOKS:**

1. Counselling and guidance:T.V.Rao:TMH.
2. Managing Employee Performance: Williams: Thomson, 2006.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE14	SERVICE MARKETING						

**COURSE OUTCOMES: The student is able to**

CO1: Analyse the basic concepts of service marketing. [K4]

CO2: Understand customer needs and expectations. [K2]

CO3: Develop market segmentation process in services marketing. [K6]

CO4: Importance of marketing communication in service promotion. [K5]

CO5: Evaluate the consumer grievance recovery strategies. [K5]

**SYLLABUS:****UNIT-I: INTRODUCTION TO SERVICES MARKETING**

Nature, Importance and characteristics of Services: Growth of Services Sector; Services in the Indian Economy; Classification of services, marketing services Vs. Physical services, Services Strategy.

**UNIT-II: CONSUMER BEHAVIOR IN SERVICES**

Customer Relationship Marketing: Relationship Marketing, the nature of service consumption, understanding customer needs and expectations, customer loyalty.

**UNIT-III: SERVICES MARKET SEGMENTATIONS**

The process of market segmentation, selecting the appropriate customer portfolio, positioning a service in the market, value addition to the service product, new service development.

**UNIT-IV: SERVICE PROMOTION**

The role of marketing communication, Planning and managing service delivery- Creating delivery systems in price, The role of intermediaries.

**UNIT-V: EXTERNAL MARKETING**

Word of Mouth Communication. Interactive Marketing: Management of Moments of Truth - Service Deficiencies - consumer Grievance Recovery Strategies.

**TEXT BOOKS:**

1. "Services Marketing": C.Bhattacharjee:, Excel Books, New Delhi, 2010
2. "Service Management and Marketing" :Christian Gronroos, Wiley India, New Delhi,2010

**REFERENCES:**

1. "Services Marketing "GovindApte:, Oxford University Press, New Delhi, 2010
2. S.L.Gupta, Marketing of Services, Wisdom Publication.2003

## SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19

OPEN ELECTIVE-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE13	QUALITY MANAGEMENT						

### COURSE OBJECTIVES:

1. To enable the student about quality management and modern concepts.
2. To understand various tools and techniques of manufacturing and control of a product, quality in sales and services.
3. To enrich the students in the areas of designing and fitting of different types of products.
4. To train the students in optimizing the quality cost and taking corrective measures.
5. To enlighten the student about control charts, quality circles and ISO standards.

### COURSE OUTCOME: The student is able to

**CO1:** Outline the basic concepts of Quality and its importance in survival of the organization. [K2]

**CO2:** Procure the verities of materials by evaluation of suppliers. [K5]

**CO3:** Design the suitable organizational structure to fit the company vision. [K6]

**CO4:** Justify quality levels with the use of control charts. [K5]

**CO5:** Apply the International standards by identifying defects in their products. [K3]

### SYLLABUS:

#### UNIT-I: QUALITY CONCEPTS

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

#### UNIT-II: CONTROL ON PURCHASED PRODUCT

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. MANUFACTURING QUALITY: Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

#### UNIT-III: QUALITY MANAGEMENT

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Quality policy of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

#### UNIT-IV: CONTROL CHARTS

Theory of control charts, measurement range, construction and analysis of control charts for Variables and Attributes, process capability study, uses of control charts.

**UNIT –V: ISO STANDARDIZATION**

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle- ISO-9000 and its concept of Quality Management ISO 9000 series, Taguchi method, JIT in some details.

**TEXT BOOKS:**

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.

**REFERENCE BOOKS:**

3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

---

**SYLLUBUS OF OPEN ELECTIVES OFFERED BY ALL DEPARTMENTS-R19**

---

OPEN ELECTIVE-IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code:19BCC4OE14	LOGISTICS AND SUPPLY CHAIN MANAGEMENT						

**COURSE OUTCOMES: The student is able to**

CO1: Outline the basic concepts of Logistics and Supply Chain. (K1)

CO2: Analyze different logistics strategies to get competitive advantage. (K4)

CO3: Assess the profitability by measuring the logistics performance and maintaining supply chain relationships. (K5)

CO4: Adapt new strategies to compete with the rivals by selecting effective source of suppliers and pricing of the products. (K6)

**SYLLABUS:****UNIT-I: INTRODUCTION TO LOGISTICS AND SUPPLY CHAIN MANAGEMENT:**

Definition, Nature and Scope of Logistics and Supply Chain Management – Focus areas in Supply Chain Management - Customer service and retention- Basic service capability Value added services

**UNIT - II: LOGISTICS AND COMPETITIVE STRATEGY:**

Competitive advantage – Gaining Competitive advantage through logistics-Integrated supply chains– Competitive performance - Models in Logistics Management -

**UNIT - III: MEASURING LOGISTICS COSTS AND PERFORMANCE:**

The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom-line – Impact of Logistics on shareholder value - customer profitability analysis –direct product profitability – cost drivers and activity-based costing.

**UNIT - IV: LOGISTICS AND SUPPLY CHAIN RELATIONSHIPS:**

Benchmarking the logistics process and SCM operations – Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities – identifying logistics performance indicators – Channel structure.

**UNIT V: SOURCING, TRANSPORTING AND PRICING PRODUCTS:**

Sourcing decisions and transportation in supply chain – infrastructure suppliers of transport services – transportation economics and pricing – documentation - pricing and revenue management - Bullwhip Effect – CRM.

**TEXT BOOKS:**

1. Donald J. Bowersox and David J. Closs: “Logistical Management” The Integrated Supply Chain Process, TMH, 2011.
2. Edward J Bradi, John J Coyle: “A Logistics Approach to Supply Chain Management, Cengage Learning, New Delhi, 2012.

**REFERENCE BOOKS:**

1. D.K.Agrawal: “Distribution and Logistics Management”, MacMillan Publishers, 2011.
2. Sunil Chopra and Peter Meindl: “Supply chain Management: Strategy, Planning and Operation”, Pearson Education, New Delhi 2013
3. Rahul V Altekari: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009.



# NEC

**NARASARAOPETA**  
**ENGINEERING COLLEGE**

(AUTONOMOUS)