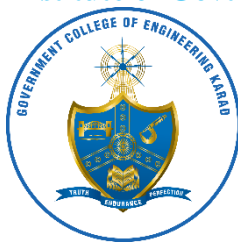# Government College of Engineering, Karad
(An Autonomous Institute of Govt. of Maharashtra)

Department of Information Technology

TY BTech IT Curriculum Structure

Academic Year: 2021-22

Institute Vision
To emerge as a technical Institute of national repute driven by excellence in imparting value based education and innovation in research to face the Global needs of profession.
Institute Mission
To create professionally competent engineers driven with the sense of responsibility towards nature and society.
Department Vision
To provide value based high quality IT education by empowering every student to be innovative and employable IT professional.
Department Mission
To offer graduate program in Information Technology for making students excellent IT professionals and encouraging them for higher studies, research and social responsibility.

Programme Educational Objectives (PEO):

PEO1	To formulate, analyse and solve real life problems in software industry.
PEO2	To excel in professional career, higher education, research by acquiring knowledge in mathematics, computing and engineering principles.
PEO3	To exhibit ethical, social, communication skill, team work and adapt new tools and technology.

Programme Outcomes (PO):

Engineering Graduates will be able to*:*
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO):

PSO1	Ability to understand, analyze and develop computer programs in the areas related to System Software, Database Systems, Networking, Web Designing.
PSO2	Ability to apply standard practices & strategies to solve IT Industry problems.

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions :Second Year B. Tech. in Information Technology

Semester – III (w.e.f. AY. 2020-21)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	CT-1	CT-2	TA/CA	ESE	TOTAL
									EXAM SCHEME				
1	HSMC	IT2301	Values and Ethics	2	-	-	2	2	15	15	10	60	100
2	BSC	IT2302	Mathematics – III	3	1	-	4	4	15	15	10	60	100
3	ESC	IT2303	Digital Systems	4	-	-	4	4	15	15	10	60	100
4	ESC	IT2304	Computer Organization and Architecture	3	-	-	3	3	15	15	10	60	100
5	PCC	IT2305	Data Structure and Algorithms	3	-	-	3	3	15	15	10	60	100
6	ESC	IT2306	Digital Systems Lab	-	-	2	2	1	-	-	50	50	100
7	PCC	IT2307	Data Structure and Algorithms Lab	-	-	4	4	2	-	-	75	75	150
8	P/S/IT	IT2308	Industrial Training	-	-	2	2	1	-	-	50	-	50
			Total	**15**	**01**	**08**	**24**	**20**	**75**	**75**	**225**	**425**	**800**

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	02	04	08	05	--	--	--	01
Cumulative Sum	05	22	24	05	--	--	--	01

PROGRESSIVE TOTAL CREDITS :37+20 =57

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions : Second Year B. Tech. in Information Technology

Semester – IV (w.e.f. AY. 2020-21)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs /Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	OEC	IT2401	Microprocessor and Microcontroller	3	-	-	3	3	15	15	10	60	100
2	PCC	IT2402	Discrete Mathematics	3	1	-	4	4	15	15	10	60	100
3	PCC	IT2403	System Software and Operating Systems	3	-	-	3	3	15	15	10	60	100
4	PCC	IT2404	Database Management System	3	-	-	3	3	15	15	10	60	100
5	PCC	IT2405	Object Oriented Programming	3	-	-	3	3	15	15	10	60	100
6	OEC	IT2406	Microprocessor and Microcontroller Lab	-	-	2	2	1	-	-	25	-	25
7	PCC	IT2407	System Software and Operating Systems Lab	-	-	2	2	1	-	-	50	-	50
8	PCC	IT2408	Database Management System Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	IT2409	Object Oriented Programming Lab	-	-	2	2	1	-	-	50	25	75
10	MCC	IT2410	Environmental Science	2	-	-	2	Audit	15	15	10	60	100
			Total	17	01	08	26	20	90	90	210	410	800

L- Lecture   T-Tutorial   P-Practical
CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment
CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	--	--	--	16	--	04	Yes	--
Cumulative Sum	05	22	24	21	--	04	--	01

PROGRESSIVE TOTAL CREDITS :57+20 =77

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions: Third Year B. Tech. in Information Technology

Semester – V (w.e.f. AY. 2021-22)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	OEC	IT2501	Geo Informatics	3	-	-	3	3	15	15	10	60	100
2	PCC	IT2502	Computer Networks	3	-	-	3	3	15	15	10	60	100
3	PCC	IT2503	Design and Analysis of Algorithms	3	-	-	3	3	15	15	10	60	100
4	PCC	IT2504	Theory of Computation	3	-	-	3	3	15	15	10	60	100
5	PEC	IT25*5	Elective – I	3	-	-	3	3	15	15	10	60	100
6	OEC	IT2506	Geo Informatics Lab	-	-	2	2	1	-	-	25	-	25
7	PCC	IT2507	Computer Networks Lab	-	-	2	2	1	-	-	50	-	50
8	PCC	IT2508	Design and Analysis of Algorithms Lab	-	-	2	2	1	-	-	50	25	75
9	PCC	IT2509	Programming Lab I	-	-	2	2	1	-	-	25	25	50
10	P/S/IT	IT2510	Mini Project	-	-	2	2	1	-	-	25	25	50
11	P/S/IT	IT2511	Industrial Training	-	-	2	2	1			50	-	50
			Total	15	00	12	27	21	75	75	275	375	800

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	--	--	--	12	03	04	--	02
Cumulative Sum	05	22	24	33	03	08	Yes	03

PROGRESSIVE TOTAL CREDITS :77+21= 98

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions :Third Year B. Tech. in Information Technology

Semester – VI (w.e.f. AY. 2021-22)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	HSMC	IT2601	Economics for Engineers	2	-	-	2	2	15	15	10	60	100
2	OEC	IT2602	Internet of Things	3	-	-	3	3	15	15	10	60	100
3	PEC	IT26*3	Elective – II	3	-	-	3	3	15	15	10	60	100
4	PCC	IT2604	Software Engineering	3	-	-	3	3	15	15	10	60	100
5	PCC	IT2605	Big Data Analytics	3	-	-	3	3	15	15	10	60	100
6	OEC	IT2606	Internet of Things Lab	-	-	2	2	1	-	-	50	-	50
7	PCC	IT2607	Big Data Analytics Lab	-	-	2	2	1	-	-	50	-	50
8	PCC	IT2608	Advanced Software Technology Lab	1	-	2	3	2	-	-	50	50	100
9	PCC	IT2609	Programming Lab II	-	-	2	2	1	-	-	25	25	50
10	P/S/IT	IT2610	Technical Presentation	-	1	-	1	1	-	-	50	-	50
			Total	**15**	**01**	**08**	**24**	**20**	**75**	**75**	**275**	**375**	**800**

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	02	--	--	10	03	04	--	01
Cumulative Sum	07	22	24	43	06	12	Yes	04

PROGRESSIVE TOTAL CREDITS:98+20=118

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions : Final Year B. Tech. in Information Technology

Semester – VII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Course Credits	CT-1	CT-2	TA/CA	ESE	TOTAL
1	HSMC	IT2701	Law for Engineers	3	-	-	3	3	15	15	10	60	100
2	OEC	IT2702	Robotics and Automation	3	-	-	3	3	15	15	10	60	100
3	PEC	IT27*3	Elective – III	3	-	-	3	3	15	15	10	60	100
4	PEC	IT27*4	Elective – IV	3	-	-	3	3	15	15	10	60	100
5	PCC	IT2705	Information Security	3	-	-	3	3	15	15	10	60	100
6	PCC	IT2706	Cloud Computing and Infrastructure Services	3	-	-	3	3	15	15	10	60	100
7	OEC	IT2707	Robotics and Automation Lab	-	-	2	2	1	-	-	25	-	25
8	PEC	IT27*8	Elective – III Lab	-	-	2	2	1	-	-	25	-	25
9	PCC	IT2709	Information Security Lab	-	-	2	2	1	-	-	25	25	50
10	PCC	IT2710	Cloud Computing and Infrastructure Services Lab	-	-	2	2	1	-	-	25	25	50
11	P/S/IT	IT2711	Seminar	-	1	-	1	1	-	-	25	25	50
12	P/S/IT	IT2712	Industrial Training	-	-	2	2	1	-	-	50	-	50
			Total	**18**	**01**	**10**	**29**	**24**	**90**	**90**	**235**	**435**	**850**

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	03	--	--	08	07	04	--	02
Cumulative Sum	10	22	24	51	13	16	Yes	06

PROGRESSIVE TOTAL CREDITS : 118+24 = 142

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions : Final Year B. Tech. in Information Technology (ACADEMIC MODE)

Semester – VIII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Course Credits	CT-1	CT-2	TA/CA	ESE	TOTAL
									EXAM SCHEME				
1	OEC	IT2801	Augmented Reality and Virtual Reality	3	-	-	3	3	15	15	10	60	100
2	PEC	IT28*2	Elective – V	3	-	-	3	3	15	15	10	60	100
3	OEC	IT2803	Augmented Reality and Virtual Reality Lab	-	-	2	2	1	-	-	50	-	50
4	PEC	IT28*4	Elective – V Lab	-	-	2	2	1	-	-	50	50	100
5	P/S/IT	IT2805	Project	-	-	20	20	10	-	-	200	200	400
			Total	**06**	**00**	**24**	**30**	**18**	**30**	**30**	**320**	**370**	**750**

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	--	--	--	---	04	04	--	10
Cumulative Sum	10	22	24	51	17	20	Yes	16

PROGRESSIVE TOTAL CREDITS:142+18= 160

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions : Final Year B. Tech. in Information Technology (INDUSTRY MODE)

Semester – VIII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Course Credits	CT-1	CT-2	TA/CA	ESE	TOTAL
									EXAM SCHEME				
1	MOOC	IT2806	MOOC – 1	-	-	-	-	4	-	-	-	-	200
2	MOOC	IT2807	MOOC – 2	-	-	-	-	4	-	-	-	-	200
3	P/S/IT	IT2808	Project	-	-	-	-	10	-	-	150	200	350
			Total	**00**	**00**	**00**	**00**	**18**	**00**	**00**	**200**	**200**	**750**

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Credits	--	--	--	--	--	--	--	10	08
Cumulative Sum	10	22	24	51	13	16	Yes	16	08

PROGRESSIVE TOTAL CREDITS :142+18= 160

List of Elective subject:

Elective-I	Elective-II	Elective-III	Elective-IV	Elective-V
IT2515: Artificial Intelligence	**IT2613:**Soft Computing	**IT2713:**Machine Learning	**IT2714:**Cognitive Computing	**IT2812:**Natural Language Processing
IT2525: Signals and Systems	**IT2623:**Digital Signal Processing	**IT2723:**Multimedia Systems	**IT2724:**Image Processing	**IT2822:**Computer Vision
IT2535: Advanced Database Management System	**IT2633:**Data warehousing and Data Mining	**IT2733:**Information Retrieval and Web Mining	**IT2734:**ERP and Business Intelligence	**IT2832:**Software Testing and Quality Assurance
IT2545: Operating System and Design	**IT2643:**Advanced Computer Networks	**IT2743:**Distributed Operating System	**IT2744:**Object Oriented Modelling and Design	**IT2842:**High Performance Computing

Elective-III Lab	Elective-V Lab
IT2718: Machine Learning Lab	**IT2814:**Natural Language Processing Lab
IT2728: Multimedia Systems Lab	**IT2824:**Computer Vision Lab
IT2738: Information Retrieval and Web Mining Lab	**IT2844:**Software Testing and Quality Assurance Lab
IT2748: Distributed Operating System Lab	**IT2854:**High Performance Computing Lab

Government College of Engineering, Karad
(An Autonomous Institute of Govt. of Maharashtra)

Department of Information Technology

TY BTech IT Curriculum (Semester V and VI)

w.e.f. Academic Year: 2021-22

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To emerge as a technical Institute of national repute driven by excellence in imparting value based education and innovation in research to face the Global needs of profession.
Institute Mission
To create professionally competent engineers driven with the sense of responsibility towards nature and society.
Department Vision
To provide value based high quality IT education by empowering every student to be innovative and employable IT professional.
Department Mission
To offer graduate program in Information Technology for making students excellent IT professionals and encouraging them for higher studies, research and social responsibility.

Programme Educational Objectives (PEO):

PEO1	To formulate, analyse and solve real life problems in software industry.
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PSO1	Ability to understand, analyze and develop computer programs in the areas related to System Software, Database Systems, Networking, Web Designing.
PSO2	Ability to apply standard practices & strategies to solve IT Industry problems.

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
IT2501: Geo Informatics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Practical	-		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Explain the fundamentals of GIS.
2.	Illustrate data management functions and data output.
3.	Adapt the knowledge on data quality and standards.
4.	Identify the role of Geo informatics in various applications.

	Course Contents	Hours
Unit 1	**Fundamentals of GIS:**	**(08)**
	Introduction to GIS, Basic spatial concepts, Coordinate Systems, GIS and Information Systems, Definitions, History of GIS, Components of a GIS, Hardware, Software, Data, People, Methods, Proprietary and open source Software - Types of data, Spatial, Attribute data types of attributes – scales/ levels of measurements.	
Unit 2	**Spatial Data Models:**	**(07)**
	Database Structures, Relational, Object Oriented, ER diagram, spatial data models, Raster Data Structures, Raster Data Compression, Vector Data Structures, Raster vs Vector Models, TIN and GRID data models, OGC standards, Data Quality.	
Unit 3	**Data Input And Topology:**	**(07)**
	Scanner, Raster Data Input , Raster Data File Formats, Vector Data Input, Digitiser, Topology, Adjacency, connectivity and containment, Topological Consistency rules, Attribute Data linking , ODBC , GPS, Concept GPS based mapping.	
Unit 4	**Data Analysis:**	**(06)**
	Vector Data Analysis tools, Data Analysis tools, Network Analysis, Digital Education models, 3D data collection and utilisation. (**Self-Study:** Uncertainty in GIS and Error Propagation)	
Unit 5	**Applications:**	**(06)**
	Geo informatics Applicant, Natural Resource Management, Engineering ,Navigation, Vehicle tracking and fleet management, Marketing and Business applications, Case studies.	
Unit 6	**Geoinformation:**	**(06)**
	Information System, GIS, GPS, Information retrieval system , Geo-database, interactive applications, Multimedia applications , Earth resource platform , Google maps and Google earth, LBS, Introduction to Integration of Geo-database. Introduction to GIS security issues. (**Self-Study:** Social networking applications)	

Text Books

1.	Kang Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, 2nd Edition, 2011. (Unit: 1, 2, 4, 5, 6)
2.	Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2ndEdition, 2007.(Unit: 1, 2, 3, 4)
3.	R. Kelly Rainer, Casey G. Cegielski, Brad Prince, "Introduction to Information Systems", Wiley Publication, 5thEdition, 2014. (Unit: 6)

Reference Books

1.	Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.
2.	Margarita N. Favorskaya and Lakhmi C. Jain, "Handbook on Advances in Remote Sensing and Geographic Information Systems", Springer Publishers, 2018.
3.	Brent Hall, Michael G. Leahy, "Open Source Approaches in Spatial Data Handling" Springer Publishers, 2008.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	-	2	2	1	-	-	-	-	-	-
CO 2	1	2	2	-	1	-	-	-	-	-	3	1	2	1
CO 3	1	-	1	1	1	-	-	-	-	-	2	1	1	-
CO 4	2	1	1	-	1	3	1	2	-	-	1	1	1	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand		-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad			
Third Year (Sem – V) B. Tech. Information Technology			
IT2502: Computer Networks			
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Define basic data communication system.
2.	Design and analyze different routing algorithms.
3.	Understand various protocols and network technologies.
4.	Explain working principle of client/server applications concern to application layer protocols.

	Course Contents	Hours
Unit 1	**Physical Layer:** Components of data communication, Data Flow. Networks: Definition, Uses, Topologies, Categories. Network Models-Layered tasks, the OSI reference model, TCP/IP protocol suit, Transmission Media, Guided Transmission Media, Twisted pair, Coaxial, OFC, Unguided Transmission Media, Propagation Modes, Radio Waves, Microwave, Infrared. Connecting devices: Connectors, Transceivers and Media Converters, Repeaters, Hubs (**Self-Study**: Wireless Networks)	**(06)**
Unit 2	**Data link Layer:** Framing, Channel Allocation Problem-Static and Dynamic Allocation, Multiple Access Protocols-ALOHA, CSMA, CSMA/CD,CSMA/CA. Ethernet-cabling, coding, binary exponential back off algorithm, performance, switched Ethernet, fast Ethernet, gigabit Ethernet. IEEE 802.2LLC. Wireless LANs-802.11 stack, physical layer, MAC, frame structure.802.16 introduction. (**Self-Stud**y: comparison of 802.11 and 802.16)	**(06)**
Unit 3	**The Network Layer:** Network Layer Design Issues-packet switching, services to transport layer, implementation of connectionless and oriented service, comparison VC and datagram subnets. Routing Algorithms-principal of optimality, static and dynamic routing, flooding. The Network Layer in the Internet: internet control protocols- OSPF, BGP, Internet Multicast Protocol, IP address, Mobile IP, Introduction to IPv6	**(07)**
Unit 4	**Congestion Control:** Congestion Control Algorithms- principals, prevention policies, jitter and load shedding, Quality of Service- requirements, techniques for achieving good quality of service, Internetworking concatenated VC, Connectionless Internet working, tunnelling, Internetwork routing, fragmentation.	**(07)**
Unit 5	**The Transport Layer:** The Transport Service-services to upper layer, service primitives, Berkley Socket, "C" Socket programming details. The Transport Layer: Elements of Transport Protocols- addressing, connection establishment, release, flow control, buffering, multiplexing, crash recovery. Transport Protocols- introduction to UDP, RPC, RTP, TCP service model, TCP protocol, TCP segment header, TCP connection establishment, Release, congestion control in TCP, timer management, Wireless TCP and UDP.	**(07)**
Unit 6	**The Application Layer:** DNS- The Domain Name System, name space, resource records, name servers. Electronic Mail-architecture and service, user agent, message format and transfer final delivery. The World Wide Web-architecture overview, static and dynamic web documents, HTTP, performance enhancements, wireless web. Multimedia, Introduction to audio and video communication and compression, Voice over IP.	**(07)**
Text Books			

1.	Andrew S. Tannenbaum, "Computer Networks", PHI, 4th Edition, 2003. (Unit-1,2,3,5,6)			
2.	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson Publication, 6th Edition, 2013. (Unit-4,5,6)			

Reference Books

1.	B.A. Forouzan, "Data communication & networking", Tata Mc-Graw Hills, 5th Edition, 2004.			
2.	Dr. Sunilkumar Manavi and M. Kakkasageri, "Wireless and mobile networks concepts and protocols", Wiley publication, 2010.			

Useful Links

1.	https://nptel.ac.in/courses/106/105/106105183/ Prof. S. K. GhoshIITKharghar.
2.	https://nptel.ac.in/courses/106/105/106105082/ Prof. A. Pal IIT Kharghar.
3.	https://nptel.ac.in/courses/106/101/106101209/ Prof. S. Iyer, IIT Bombay.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	1
CO 2	-	-	2	1	3	-	-	-	-	-	-	-	2	-
CO 3	-	-	1	-	3	-	-	-	-	-	-	-	2	-
CO 4	-	-	3	-	2	-	-	-	-	-	-	-	1	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad			
Third Year (Sem – V) B. Tech. Information Technology			
IT2503: Design and Analysis of Algorithms			
Teaching Scheme			**Examination Scheme**
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Interpret the algorithm analysis techniques.
2.	Analyse the efficiency of alternative algorithmic solutions for the same problem.
3.	Select appropriate algorithm design techniques for solving problems.
4.	Apply efficient algorithms in common engineering design situations.

	Course Contents	Hours
Unit 1	**Introduction to Algorithm:** The role of algorithms in computing, Characteristics of algorithm, Analysing algorithm, Asymptotic analysis of complexity bounds-Best, Average and worst case behaviour, Designing algorithm, Performance measurements of algorithm: Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters theorem.	**(08)**
Unit 2	**Divide and Conquer:** General Method, Binary Search, Medians and order statistics - Finding Maximum and Minimum in expected linear time and worst case linear time, The heap sort algorithm and priority queues, Analysis of Merge Sort, Analysis of Quick Sort, (**Self Study:** Analysis of Selection Sort)	**(07)**
Unit 3	**Greedy Method:** General Method, Knapsack problem, Tree Vertex Splitting, Minimum Cost Spanning tree (Prim's and Kruskal's algorithms), Optimal Merge Pattern, Single Source Shortest Paths Graph and Tree Algorithms: Techniques for Binary Trees, Techniques for Graphs, Connected Components and spanning trees, Biconnected Components and DFS	**(08)**
Unit 4	**Dynamic Programming:** General Method, Multistage Graphs, All pair shortest paths, Single-source shortest path, Optimal Binary Search Trees, Travelling Salesman problem	**(06)**
Unit 5	**Backtracking:** General Method, Eight queens problem, Sum of Subsets, Graph coloring problem, Hamiltonian problem, Complexity Theory - P time, P time verification, NP-hard class, NP-complete class (**Self Study:** Travelling Salesman problem)	**(07)**
Unit 6	**Advances in Algorithms**: Approximation Algorithms:Introduction, Absolute Approximations, ε-approximations, Polynomial time approximation schemes, Introduction to parallel architectures - PRAM, MESH and Hypercube	**(06)**

Text Books

1.	Thomas Cormen, Charles Leiserson, "Introduction to Algorithms", MIT Press McGraw-Hill, 4th Edition, 2001. (Unit-1,2)
2.	Horowitz Ellis, SahaniSartaz, "Fundamentals of Computer Algorithms", W. H. Freeman & Company, 4th Edition, 2008. (Unit-3,4,5,6)

Reference Books

1.	Aho, Hopfcraft and Ullman, "Design and Analysis of Algorithms",Addison Wesley, 1st Edition, 2002.
2.	Rami G. Melhem, "Introduction to Parallel Processing - Algorithms and Architectures", Kluwer Publications, 2nd Edition, 2006.
3.	Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson publication, 1st Edition, 2009.
4.	Michael Goodrich, Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley, 2nd Edition, 2001.

5.	UdiManber, "Algorithms: A Creative Approach", Addison-Wesley, 3rd Edition, 1989.			
Useful Links				
1.	https://nptel.ac.in/courses/106/101/106101060/	Prof. A. Ranade, IIT Bombay		
2.	https://nptel.ac.in/courses/106/106/106106131/	Prof. MadhavanMukund, IIT Madras		
3.	https://nptel.ac.in/courses/106/105/106105164/	Prof. S. Mukhopadhyay,IITKharagpur		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	1	-	-	-	-	-	-	-	1	2
CO 2	2	2	1	2	-	-	-	-	-	-	-	-	2	2
CO 3	2	1	2	2	-	-	-	-	-	-	-	-	1	3
CO 4	2	2	2	2	-	-	-	-	-	-	-	-	1	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	2	1	10
Understand	2	3	3	10
Apply	5	5	3	15
Analyse	5	5	3	15
Evaluate				10
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad			
Third Year (Sem – V) B. Tech. Information Technology			
IT2504: Theory of Computation			
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Design formal mathematical models of computation that reflect real-world computers.
2.	Evaluate mathematical properties of computer hardware and software.
3.	Explore limitations of computers.

	Course Contents	Hours
Unit 1	**Finite Automata:** Basics of Strings and Alphabets, DFA, transition graphs, regular languages, non-deterministic FA, equivalence of DFA and NDFA, Finite Automata with Epsilon Transitions. Equivalence and Minimization of Automata.	**(06)**
Unit 2	**Regular Expressions and Languages:** Regular Expressions, Equivalence between finite automata and regular expression, Closure Properties of Regular Languages, pumping lemma **(Self Study:** Applications of Regular Expressions)	**(07)**
Unit 3	**Grammars and Languages:** Regular Grammar, Context-Free Grammars : Definition, Derivations, Sentential Forms, Parse Trees, Ambiguity in Grammars and Languages , Context-Free Languages, Properties of Context-Free Languages, Normal Forms for CFGs-Eliminating Useless Symbols, Reachable Symbols, eliminating Null-Productions, Eliminating Unit Productions, CNF, Closure Properties of CFLs (**Self Study:** Applications of Context Free Grammars)	**(07)**
Unit 4	**Pushdown Automata:** NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL	**(06)**
Unit 5	**Turing Machine:** The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine – Multi tape, Nondeterministic Turing Machines, Semi-infinite Tapes, Universal Turing Machine, Turing Machines and Computers.	**(06)**
Unit 6	**Decidability and Computational Complexity:** Recursively Enumerable and Recursive, Enumerating a Language, Un-decidability, Halting problem, Post corresponding problems, Time complexity of Turing Machine.	**(08)**

Text Books

1.	Hopcroft, Motwani, Ullman, "Introduction to Automata Theory, Languages, and Computation", Pearson Publication, 3rdEdition. (Unit 1,2,3,4,5,6)
2.	John.C.martin, "Introduction to the Languages and the Theory of Computation", Tata McGraw Hill, 2003, 3rd Edition. (Unit 1,2,3,4,5,6)

Reference Books

1.	Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house, 4th Edition2006.
2.	Michael Sipser, "Introduction to the Theory of Computation", Thomson Learning, 1997.
3.	K.L.P.Mishra, "Theory of Computer Science: Automata, Languages and Computation", PHI, 3rd Edition.

Useful Links

1.	http://nptel.ac.in/courses/106103070/Dr.DigantaGoswami, IIT Guwahati
2.	https://www.coursera.org/course/automata Jeff Ullman, Stanford

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1	2	-	-	2	-	1	-	-	-	2	-	1
CO 2	1	3	-	1	-	-	-	-	-	-	-	-	-	1
CO 3	1	-	-	2	-	1	-	1	-	-	-	-	-	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
IT2506 : Geo Informatics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		CA	25
Total Credits	**01**			
Course Outcomes:				
Students will be able to:				
1	Experiment with data inputting and analysis of data in the open source software.			
2	Demonstrate the geo referencing and validation of maps.			
3	Analyse the data with the help of various GIS operations.			
Course Contents				
Experiment 1	Familiarizing Quantum GIS/ILWIS: Installation of QGIS/ILWIS, datasets for both Vector and Raster data, Maps.			
Experiment 2	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics.			
Experiment 3	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.			
Experiment 4	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data.			
Experiment 5	Working with attributes, terrain Data.			
Experiment 6	Working with Projections and WMS Data.			
Experiment 7	Geo referencing Topo Sheets and Scanned Maps, Geo referencing Aerial Imagery, Digitizing Map Data.			
Experiment 8	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries.			
Experiment 9	Automating Map Creation with Print Composer Atlas.			
Experiment 10	Validating Map data.			
Experiment 11	Advanced GIS Operations 1:Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data.			
Experiment 12	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler.			
Requirement Tools :	Arc GIS, Q-GIS software (Open Source software), ILWIS (Open Source software), Scanned Toposheet (Survey of India- toposheet).			
List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.				
1	Total number of Experiments : 10			
Useful Links:				
1	https://www.youtube.com/watch?v=2uy64D1OGCU Prasun ISRO-IIRS, Demo of QGIS Software : Adding GIS Data, Attribute table & Identity tool Change symbology Kumar Gupta , IIRS Dehradun			
2	https://www.youtube.com/watch?v=-JFaGY9uDp0 Prasun ISRO-IIRS, Demo of QGIS Software Digitization, Spatial Queries Linking spatial & non-spatial data Kumar Gupta , IIRS Dehradun			

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	2	1	1	-	-	-	-	3	1	2	-
CO2	-	-	2	2	1	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	1	-	-	1	-	-	-	-	1	-

1: Slight (Low)　　　　2: Moderate (Medium)　　　　3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
IT2507: Computer Networks Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		CA	50
Total Credits	**01**			

Course Outcomes:

Students will be able to:

1	Demonstrate and use of various networking tools and technologies.
2	Implement various Networking protocols.
3	Configure/Implement various client/server environments to use application layer protocols.

Course Contents	
Experiment 1	Design a Wired LAN using line tester, configuration machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wireshark Packet Analyzer Tool.
Experiment 2	Implement a Program with following four options to transfer a. Characters separated by space b. One Strings at a time c. One Sentence at a time d. file between two RS 232D or USB ports using C/C++. (To demonstrate Framing, Flow control, Error control).
Experiment 3	Implement a program for error detection and correction using Hamming Codes or CRC
Experiment 4	Implement a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol
Experiment 5	Implement a program to demonstrate subnetting and find the subnet masks.
Experiment 6	Implement a program to simulate the behaviour of link state routing protocol to find suitable path for transmission.
Experiment 7	Implement a program using TCP socket for wired network for following a. Say Hello to each other b. File transfer
Experiment 8	Implement a program for DNS lookup. Given an IP address input, it should return URL and vice versa.
Experiment 9	Install and configure DHCP server and write a program to install the software on remote machine.
Experiment 10	Study of any network simulation tools - To create a network with three nodes and establish a TCP connection between node 0 and node 1 such that node 0 will send TCP packet to node 2 via node 1 3.
Experiment 11	Configure RIP/OSPF/BGP using packet Tracer.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Total number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	3	1	-	-	1	-	-	-	-	2	-
CO2	-	-	-	2	1	-	-	1	-	-	-	-	3	-
CO3	-	-	-	1	2	-	-	1	-	-	-	-	2	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad
Third Year (Sem – V) B. Tech. Information Technology
IT2508 : Design and Analysis of Algorithms Lab

Laboratory Scheme:			Examination Scheme:	
Practical	2Hrs/week		CA	50
Total Credits	**01**		ESE	25

Course Outcomes:

Students will be able to:

1	Apply algorithmic approaches to solve the real world problems.
2	Analyse their complexity of algorithms.
3	Demonstrate tree and graph traversal techniques.
4	Discuss various algorithm designing techniques with their performance comparisons and use the appropriate one while developing the applications.

Course Contents	
Experiment 1	Implement Linear and Binary search techniques using array and/or trees and analyse their time complexity.
Experiment 2	Implement quick sort, merge sort and heal sort algorithms using array as a data structure and analyse its time complexity for different values of n.
Experiment 3	Implement Fractional Knapsack problem using Greedy method.
Experiment 4	Apply Greedy method to solve problems of Optimal Merge Pattern.
Experiment 5	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm and Kruskal's algorithm and compare.
Experiment 6	Find shortest paths to other vertices using Dijkstra's algorithm from a given vertex in a weighted connected graph.
Experiment 7	Implement Optimal binary search trees using Dynamic Programming.
Experiment 8	Implement Multistage Graphs using Dynamic Programming.
Experiment 9	Implement any scheme to find optimal solution for the Traveling Salesperson problem and then solve the problem instance using any approximation algorithm and find error in approximation.
Experiment 10	Implement 8-Queen's problem using Back Tracking.
Experiment 11	Implement Graph Colouring Problem using Back Tracking.
Experiment 12	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm by creating multiple threads and determine the speed-up achieved.
Experiment 13	Compare and evaluate the performance of different Approximation algorithms.
List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.	
1.	Total number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	3	1	-	-	1	-	-	-	-	2	1
CO2	2	1	3	2	1	-	-	1	-	-	-	-	2	1
CO3	2	2	3	3	1	-	-	1	-	-	-	-	2	1

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad		
Third Year (Sem – V) B. Tech. Information Technology		
IT2509 : Programming Lab I		

Laboratory Scheme:			Examination Scheme:	
Practical	2 Hrs/week		CA	25
Total Credits	**01**		ESE	25

Course Outcomes:

Students will be able to:

1	Implement object oriented features using java programming language.
2	Demonstrate client server application using networking.
3	Implement GUI applications using event handling and Swing.

Course Contents

Experiment 1	Write Java Program for Class, Objects and Methods.
Experiment 2	Write Java Program for Constructor and Method overloading.
Experiment 3	Implement the concept of Inheritance and Interface.
Experiment 4	Implement the program for Exception handling.
Experiment 5	Implement the concept of Multithreading.
Experiment 6	Implement the concept of I/O Programming.
Experiment 7	Implement program for Applet with AWT controls.
Experiment 8	Program for creation of Frame and Window using Swing.
Experiment 9	Program to demonstrate Event handling concept.
Experiment 10	Implement a Client-Server Network programming.
Experiment 11	Program to demonstrate various methods of Collection class.
Experiment 12	Program for Database Connectivity using JDBC and ODBC.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Total number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	3	3	2	3	-	-	2	-	-	-	-	2	1
CO2	-	3	3	2	3	-	-	2	-	-	-	-	2	1
CO3	-	3	-	-	3	-	-	2	-	-	-	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
IT2510 : Mini Project				
Laboratory Scheme:			Examination Scheme:	
Practical	2 Hrs/week		CA	25
Total Credits	**01**		ESE	25

Course Outcomes:

Students will be able to:

1	Ability to understand community needs.
2	Ability to convert idea in to product.
3	Ability to work in group.
4	Ability to communicate effectively with customers.

Course Contents

The specific objectives of the course could depend on the problem definition for the project but the overall performance must be measured on the following criteria.

1. Literature survey and Problem statement- Students should be able to define the problem statement with clearly specified inputs and outputs. Goals for complex problems could evolve over time but it is necessary to have one in the beginning. A brief survey of the available literature and an initial draft of possible directions should be adequate.

2. Modeling or Theoretical results- An appropriate model should be chosen for the problem. They should be able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance. In case of theoretical work one should be able to describe the underlying mathematical basis of such problems in the literature.

3. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use.

4. Demonstration and Presentation- A model designed and implemented (or results derived or proved in case of theory) should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work. The purpose is to measure understanding of the techniques and methods used and to appreciate the results in the larger context of their applicability in science and engineering.

Maximum two students may carry out the mini project together. Evaluation will be done based on presentations, written report and developed system.

Project Report Format:

Project report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4

2. Top Margin: 1.00 Inch

3. Bottom Margin: 1.32 Inches

4. Left Margin: 1.5 Inches

5. Right Margin: 1.0 Inch

6. Para Text: Times New Roman 12 Point Font

7. Line Spacing: 1.5 Lines

8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman

9. Headings: Times New Roman, 14 Point Bold Face

10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to group and not to individual student. Certificate should have signatures of

	Guide, Head of Department and Principal/ Director.
	11. Index of Report:
	a. Title Sheet
	b. Certificate
	c. Acknowledgement
	d. Table of Contents
	e. List of Figures
	f. List of Tables
	12. References: References should have the following format
	For Books: "Title of Book", Authors, Publisher, Edition
	For Papers: "Title of Paper", Authors, Journal/Conference Details, Year
List of Submission:
1.	Working model of the software project.
2.	Project Report.
3.	Presentation and demonstration of project in exhibition.

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	3	2	2	3	2	2	2	3	3	3
CO2	2	3	3	2	3	2	1	2	3	2	2	3	3	3
CO3	2	3	3	2	3	2	2	2	2	3	2	3	3	3
CO4	2	3	3	2	3	2	1	2	2	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

One supervisor from the department shall be assigned five project groups of the mini project. The weekly load for the supervisor is 2Hr/week. The continuous assessment shall be done by the supervisor based on attributes like problem analysis, design, development of solutions, and modern tool usage.

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
IT2511 : Industrial Training				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		CA	50
Total Credits	**01**			

Course Outcomes:

Students will be able to:

1	Apply the knowledge of Information Technology taught in the lecture rooms in real industrial situations and get a feel of the work environment.
2	Define and analyse the industrial problem.
3	Design, develop and implement in group project.

Course Contents

PART I : Industrial Training

The students must undergo an industrial training of minimum two-three weeks in an industry preferably dealing with computer and IT industry. It is expected that students should complete work assignment given by industry. The industrial training completed by the students during summer vacation after second year and needs to be assessed in the fifth semester of their third year.

Industrial Training/Internship Report Format:

Maximum five students shall work under one faculty guide nominated by Head of Department. However, each student should have industrial training and its presentation. The report should be of 20 to 30 pages. For standardization of the report the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point. Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point., Bold Face
10. Certificate: All students should attach standard format of certificate as described by the department. Certificate should have signatures of Guide, Head of Department and Principal/Director.
11. The entire report should be documented as
    - "Name of Industry with address along with completed training certificate"
    - Area in which Industrial training is completed. All Students must present their reports individually.

Internship Guidelines

Student internships for credit at GCE Karad are carefully monitored, work experiences in which students have intentional learning goals gained through experience in a professional workplace under the general supervision of an experienced professional. Best practices and tools used in industry has to be mentioned specifically in the report.

General Information

- It is the student's responsibility to seek the internship and successfully go through the hiring process of the company they choose.
- Internships may vary in duration but generally for 96 hours (minimum).

- Attendance sheets are required and it is the responsibility of the student to submit a time sheet after two weeks (signed by their supervisor) via paper copy to their Internship Coordinator directly.
- Internship hours must be completed with one company for the duration of the semester. Transferring hours from one company to another for the same applied credit during the same semester will not be allowed.

Assessment Guideline:

The students must submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department.

An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	1	1	1	1	1	1	2
CO2	-	3	-	-	2	-	-	1	1	2	1	1	2	0
CO3	-	2	3	-	2	-	-	1	2	2	2	1	2	0

1: Slight(Low)   2: Moderate(Medium)   3: Substantial(High)

Government College of Engineering, Karad			
Third Year (Sem – V) B. Tech. Information Technology			
Elective-I: IT2515:Artificial Intelligence			
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Apply artificial intelligence techniques for problem solving.
2.	Analyze and design a real-world problem for implementation and understand the behaviour of intelligent agents.
3.	Develop knowledge of decision making and learning methods.

	Course Contents	Hours
Unit 1	**Introduction to Intelligent Systems:** Introduction, History, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.	**(06)**
Unit 2	**Problem Solving:** Problem solving process, Problem analysis and representation, Problem space and search, Toy problems, real world problems, Problem reduction methods, General Search algorithms, Uninformed Search methods, Informed (Heuristic) Search {A* search methods, Heuristic Functions, AO*, Local Search Algorithms and optimization problems, Adversarial search methods, (**Self-study:** Important concepts of game theory)	**(06)**
Unit 3	**Knowledge, Reasoning and Planning:** Knowledge based agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Horn clauses and definite clauses, First-Order Logic, Representation Revisited, Syntax and Semantics of First-Order Logic, Knowledge Representation, Knowledge Engineering in First-Order Logic, Classical Planning, Planning Graphs, Ontological Engineering.	**(08)**
Unit 4	**Uncertain Knowledge:** Quantifying Uncertainty, Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Bayes' Rule and Its Use, Naive Bayes Models, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks , Inference in Bayesian Networks.	**(07)**
Unit 5	**Communicating, Perceiving, and Acting:** Machine Learning Concepts, Natural Language Processing, Language Models, Grammar, Parsing, Augmented Grammars, Deep Learning for Natural Language Processing, Word Embedding, Recurrent Neural Networks for NLP , Sequence-to-Sequence Models, The Transformer Architecture, Computer Vision, Image Formation, Simple Image Features, Classifying Images, Detecting Objects, The 3D World, Using Computer Vision.	**(07)**
Unit 6	**AI Applications:** Early Image-Processing Operations, Object Recognition by Appearance, Reconstructing the 3D World, Object Recognition from Structural Information, Using Vision, AI in Medicine, AI in Healthcare Industry (**Self Study:** Robotics)	**(06)**

Text Books

1.	Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 3rd Edition, 2009.(Unit:1,2,3,4,5)
2.	Mike Barlow, "AI and Medicine, Data-Driven Strategies for Improving Healthcare and Saving Lives", O"Reilly, 1st Edition, 2016. (Unit:6)

Reference Books

1.	Rich E., Knight K., "Artificial Intelligence", Tata McGraw Hill, 3rd Edition, 2017.

2.	Nilsson N. J., "Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publication, International student edition, 1998.
3.	Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, 3rd Edition, 1992.
Useful Links	
1.	http://www.nptelvideos.in/2012/11/artificial-intelligence.html Prof. Sudeshna Sarkar and Prof. Anupam Basu, IIT, Kharagpur
2.	http://www.nptelvideos.com/computer_science/artificial_intelligence_video_lectures.php Prof. P. Dasgupta IIT, Kharagpur

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	2	-	1	-	-	-	-	-	-	2
CO 2	-	3	3	-	-	-	-	-	-	-	-	-	2	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

<table>
<tr><td colspan="5" align="center">Government College of Engineering, Karad</td></tr>
<tr><td colspan="5" align="center">Third Year (Sem – V) B. Tech. Information Technology</td></tr>
<tr><td colspan="5" align="center">Elective-I: IT2525: Signals and Systems</td></tr>
</table>

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
2.	Classify systems based on their properties and determine the response of LSI system using convolution.
3.	Analyze system properties based on impulse response and Fourier analysis.
4.	Apply the Laplace transform and Z-transform for analysis of continuous-time and discrete-time signals and systems.

		Course Contents	Hours
Unit 1		**Introduction to Signals and Systems:** Introduction to Signals and Systems: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, reliability, Examples.	**(08)**
Unit 2		**Behaviour of continuous and discrete-time LTI systems:** Impulse response and step response, convolution, input-output behaviour with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.	**(06)**
Unit 3		**Fourier Series and Transform:** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.	**(06)**
Unit 4		**Laplace and z-Transforms:** Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour.	**(06)**
Unit 5		**Sampling and Reconstruction:** The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, (**Self Study**: feedback control systems).	**(08)**
Unit 6		**The z-Transform:** The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, (**Self Study**: z-domain analysis).	**(06)**

Text Books

1.	A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 2nd Edition, 1997. (Unit 1)
2.	H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2nd Edition, 2010. (Unit 2,3,4,5,6)

Reference Books			
1.	J. G. Proakis, D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson, 2006.		
2.	M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.		
3.	S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.		
Useful Links			
1.	https://nptel.ac.in/courses/108/104/108104100/ Prof. Aditya K. Jagannathm, IIT Kanpur.		
2.	https://nptel.ac.in/courses/117/101/117101055/ Prof. KamalikaDatta, IIT Bombay.		
3.	https://onlinecourses.nptel.ac.in/noc20ee06/preview Prof. Kushal K. Shah, IISER Bhopal		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	2	-	-	-	-	-	-	-	-	2
CO 2	2	-	-	-	2	-	-	-	-	-	-	-	1	-
CO 3	2	-	-	-	1	-	-	-	-	-	-	-	2	-
CO 4	2	-	-	-	1	-	-	-	-	-	-	-	2	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	20
Analyse	5	5	3	20
Evaluate	-	-	1	-
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – V) B. Tech. Information Technology				
Elective-I: IT2535: Advanced Database Management System				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Describe system architecture of database with data models and design ER Models.
2.	Design database schemas using object oriented and object relational database.
3.	Learn XML and OLAP Implementation Techniques.

Course Contents		Hours
Unit 1	**Extended ER:** Specialization and Generalization, Subclass super class, Constraints and characteristics of specialization and Generalization, Relationship types of degree Higher than two, Aggregation, Union and Categories.	**(06)**
Unit 2	**Object Oriented Databases:** Overview of object oriented concepts, object identity, object structure and type constructors, encapsulation of operations, methods and persistence, type hierarchies and inheritance, type extends and queries, complex objects, OQL basics	**(06)**
Unit 3	**Object Relational Database:** Nested relations and collections, inheritances, reference types, functions and procedures, storage and access methods, query processing and optimization, an overview of SQL-3, comparison of RDBMS, OODMBS, ORDBMS. (**Self- Study:** Study and Implementation of PhP Myadmin and SQLite)	**(06)**
Unit 4	**Parallel Database and Distributed Database:** Architectures for parallel databases, parallel query evaluation, sorting, joins, Distributed database concepts, data fragmentation, replication and allocation techniques for distributed database design, query processing in distributed databases. Concurrency control and recovery in distributed database	**(08)**
Unit 5	**XML:** Introduction, Structure of XML Data, XML Document Schema, DTD, Querying and Transformation: XQuery, XPath, XML validation, API to XML, Storage of XML Data	**(07)**
Unit 6	**Recent Applications:** XML Applications: Web server , Web services, Web based system, SpatialDB: Spatial Query Processing, Access Methods, Handling High-Dimensional Data, relationship between spatial databases and GIS, a Data-based and User-centric Approach to Spatial Information(**Self- Study:** Design and Implementation of Spatial DB)	**(08)**

Text Books

1.	R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Pearson Education, 5th Edition, 2013. (Unit: 1, 2, 3)
2.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw Hill Higher Education, 6th Edition, 2010. (Unit: 4, 5,6)
3.	Albert K. W. Yeung, G. Brent Hall, "Spatial Database Systems: Design, Implementation and Project Management", Springer Volume 87, 2007 (Unit:6)

Reference Books

1.	J. D. Ullman, "Principles of Database and Knowledge – Base Systems", Vol. 1, Computer Science Press.
2.	Serge Abiteboul, Richard Hull, Victor Vianu, "Foundations of Databases", Prentice Hall of India, 4th Edition 1991. ISBN: 81 – 203 – 1553 – 7.

Useful Links

1.	http://www.nptelvideos.in/2012/11/database-management-system.html Prof. D. Janakiram, IIT Madras

2.	https://nptel.ac.in/courses/106/106/106106220/	Prof. S. Kumar IIT Madras
3.	http://nptel.ac.in/courses/106106130/	Prof. D. Janakiram, IIT Madras
4.	https://www.youtube.com/watch?v=ukx7Hd4FSEw	Prof. S. K. Ghosh, IIT Roorkee

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad					
Third Year (Sem – V) B. Tech. Information Technology					
Elective-I:IT2545: Operating System and Design					
Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		CT – 1	15	
Tutorials	--		CT – 2	15	
Total Credits	**03**		TA	10	
			ESE	60	
			Duration of ESE	02 Hrs 30 Min	

Course Outcomes (CO):

Students will be able to

1.	Interpret design principal and philosophy of the Unix/Linux OS.
2.	Comprehend the architecture of Unix/Linux OS.
3.	Use system call of Unix/Linux.

	Course Contents	**Hours**
Unit 1	**Introduction:** General overview of the system- History, system structure, user perspective, operating system services, assumptions about hardware. Introduction to KERNEL: Architecture of Unix OS, introduction to system concepts, kernel data structure, system administration.	**(07)**
Unit 2	**The Buffer Cache:** Buffer headers, structure of buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, advantages and disadvantages of cache.	**(05)**
Unit 3	**Internal representation of files:** Inode, structure of regular file, directories, conversion of a pathname to inode, super block, inode assignment to new file, allocation of disk blocks, other file types.	**(07)**
Unit 4	**System calls for the file systems:** Open, read, write, file and record locking, adjusting the position of File I/O- LSEEK, close, file creation, creation of special file, change directory and change root, change owner and change mode, Stat and Fstat, Pipes, Dup, mounting and unmounting file systems, Link , Unlink, **(Self Study:** File system abstraction, File system maintenance)	**(08)**
Unit 5	**Structure of process:** Process stages and transitions, layout of system memory, File context of a process, saving context of a process, manipulation of the process address space. Process control: process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process, the shell, system boot and the Init process, process scheduling, system calls for time, clock, **(Self Study**: interprocess communication)	**(08)**
Unit 6	**Memory management policies:** Swapping, demand passing, a hybrid system with demand paging and swapping. The I/O subsystem: Driver interfaces, disk drives, terminal drivers, streams.	**(06)**

Text Books

1.	Maurice J. Bach, "The Design of Unix operating system", Prentice Hall International Inc.(Unit-1,2,3,4,5,6)
2.	Sumatabha Das, "Unix concepts and Applications", TMGH, 3rd Edition. (Unit-3,4)

Reference Books

1.	W. Richard Stevens "UNIX Network Programming" Prentice Hall, 3rdEdition.
2.	Raghvan, Lad, Neelkandan, "Embedded Linux System Design and Development", Auerbach publication.

Useful Links

1.	https://nptel.ac.in/courses/106/102/106102132/ Prof. SaurabhBansal, IIT Delhi
2.	https://nptel.ac.in/courses/106/105/106105214/ Prof. S. Chattopadhyay, IIT Kharagpur
3.	https://www.tuhs.org/Archive/Distributions/Research/Dennis_v5/v5man Unix Manuals

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	3	-	-	-	-	-	2	-	-	-	-	-
CO 2	-	2	-	-	-	-	-	-	-	-	-	2	1	-
CO 3	-	-	2	1	-	-	-	-	-	-	-	-	2	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2601: Economics for Engineers				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**02**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Understand the need, usage and importance of an information system to an organization.
2.	Learn about basic concepts of economics, micro and macro economics.
3.	Understand the importance of how industries behave.
4.	Understand the basis in our day to day life to gain personal financial control.

	Course Contents	**Hours**
Unit 1	**Basic of Information system and management:** Role of Information Systems in Organizations, The Information System Manager and his challenges, Concepts of Information Systems, Information Systems and Management Strategy Case Studies - Information Systems in the Indian Railways, Information Systems in an ecommerce Organization.	**(07)**
Unit 2	**Basic Concepts of Economics:** Definitions, Overview of Micro and Macro Economics, Explanation of theories of demand, supply and market equilibrium and Economics Basics – Cost, efficiency and scarcity, Opportunity Cost, (**Self-Study:** Use of IT in economics)	**(05)**
Unit 3	**Micro and Macro Economics:** Micro economics: Differences and Comparison, Theories of Utility and Consumers Choice, Competition and Market Structures, Macro Economics: Aggregate Demand and Supply, Economic Growth and Business Cycles, The role of the Nation in economic activity	**(07)**
Unit 4	**Industrial Economics:** Behaviour of firms: Strategies with regard to entry, pricing, advertising, and R & D and innovation. The development of Firms and Market and Industrial Structure: Stochastic models of firm growth, and market structure.	**(05)**
Unit 5	**Cash Flow:** Accounting for Depreciation and Income Taxes, Project Cash-Flow Analysis, Understanding Financial Statements, Case Studies - cash flow analysis done in start-up companies.	**(04)**
Unit 6	**Personal Economics:** Compound Interest and Credit, Financial Markets, Human Capital and Insurance, Money Management/ Budgeting, Risk and Return, Saving and Investing, (**Self-Study**: Role of IT in financial market, IT economics and data mining in stock market).	**(04)**

Text Books

1.	Rahul De, "MIS: Management Information Systems in Business, Government and Society", Wiley India, ISBN: 13: 978-81-265-2019-0. (Unit 1)
2.	Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.(Unit 5)
3.	Hay, Donald A., Derek J. Morris, "Industrial Economics and Organization: Theory and Evidence", 2nd Edition (Oxford: Oxford University Press), 1991. (Unit 4)
4.	Varian, Hal, " Intermediate Microeconomics: A Modern Approach", Norton, 5th Edition, 1999.(Unit 3)
5.	Baumol, William J., "Economic Theory and Operations Analysis", Prentice Hall India Ltd.,4th Edition, 1985. (Unit 2)
6.	Rachel Siegel, Carol Yacht, "Personal finance", Publisher Saylor Foundation ISBN 13: 9780982361863, 2009.(Unit 6)

Reference Books

1.	R.J. Gordon, "Macroeconomics", Little Brown& Co. Boston, 4th Edition,1987.

2.	Donald G. Newman, Jerome P. Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.
Useful Links	
1.	https://nptel.ac.in/courses/112/107/112107209/ Dr. P. K. Jha IIT Roorkee
2.	https://nptel.ac.in/courses/109/104/109104073/ Dr. S. Sinha IIT Kanpur
3.	https://www.econlib.org/library/Topics/HighSchool/HighSchoolTopics.html#finance

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	-	-	-	1	-	-	-	-	3	1	-	2
CO 2	1	-	-	-	-	1	-	-	-	-	3	1	-	2
CO 3	1	-	-	-	-	1	-	-	-	-	3	1	-	2
CO 4	1	-	-	-	-	1	-	-	-	-	3	3	-	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	5	5	10
Apply	-	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2602: Internet of Things				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Practical	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Demonstrate the application areas of IOT.
2.	Analyze data and knowledge management and use of devices in IOT technology.
3.	Illustrate gateways and data management in IOT.
4.	Analyze real world IOT design constraints, Industrial automation and commercial building automation in IOT.

	Course Contents	**Hours**
Unit 1	**Introduction and concepts:** Origins, Drivers, Applications, Physical and logical design of IoT, IoT enabling technologies: Wireless sensor networks, Cloud computing, Big data analytics, Communication protocols, embedded systems, IoT levels and deployment templates	**(08)**
Unit 2	**IoT and M2M:** Introduction to M2M, Difference between IoT and M2M, M2M and IoT technology fundamentals: Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a service (XaaS), M2M and IoT analytics, Knowledge management.	**(07)**
Unit 3	**IoT Architecture-state of the art:** Architecture reference model: Introduction, Reference model and architecture, IoT Reference model, M2M to IoT-an architectural overview: Building architecture, Main design principles and needed capabilities, State of the art, Standards considerations.	**(07)**
Unit 4	**Data management in IoT:** Managing M2M data, Data collection and analysis (DCA), Big data, Semantic sensor networks and semantic annotation of data, Virtual sensors, Complex event processing. (**Self- Study:** Challenges of data management in IoT)	**(06)**
Unit 5	**Security, Privacy & Trust:** IoT security challenge, Spectrum of security considerations, Unique security challenges of IoT devices, Internet of things privacy background, Unique privacy aspects of internet of things, Trust for IoT.	**(06)**
Unit 6	**Case studies Illustrating IoT design:** Home automation: Smart lighting, Home intrusion detection, Cities: Smart parking, Environment: Whether monitoring system, Weather reporting boat, Air pollution monitoring, Forest fire detection, Agriculture: Smart irrigation, Productivity applications: IoT printer. (**Self-Study :** IoT for electronic medical record**)**	**(06)**

Text Books

1.	Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach", Universities Press (India) Private Limited, 2016, ISBN: 978 81 7371 954 7. (Unit 1,2,3,4,5,6)
2.	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle "From Machine-to-Machine to the Internet of Things", Academic Press, Elsevier, 2014, ISBN: 978-0-12-407684-6. (Unit 2,3,4)

Reference Books

1.	Karen Rose, Scott Eldridge, Lyman Chapin, "The Internet of Things: An Overview", Internet Society, 2015.
2.	Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014, ISBN 978-1-118-43062-0.
3.	Daniel Kellmereit, "The Silent Intelligence: The Internet of Things", 2013, ISBN 0989973700.

Useful Links	
1.	https://www.youtube.com/watch?v=7iWriXyI2cE&list=PLsY9D2Nhu0c2-ONSwpAeRDTyz2VeSaJew Prof. S. Misra
2.	https://www.youtube.com/watch?v=Yci9PfPppiw&list=PLgMDNELGJ1CZoUIF-iKcH9TSVcmG6IBcU Dr. T. V. Prabhakar IIS, Banglore
3.	https://www.youtube.com/watch?v=bsycx2zbCxA

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	2	1	1	3	1	1	-	-	2	1	-	1
CO 2	-	-	2	3	1	-	-	-	-	-	1	1	2	-
CO 3	-	-	1	-	-	-	-	1	-	-	-	-	1	-
CO 4	1	-	3	1	1	-	1	-	-	-	-	-	-	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2604: Software Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Summarize different software process models.
2.	Understand planning and managing software projects.
3.	Prepare software requirement specification during analysis.
4.	Understand design fundamentals and Testing Techniques.

	Course Contents	Hours
Unit 1	**Introduction:** Software engineering, Product: Evolving role of software, Software Characteristics, Components, Applications, Software crisis and Myths, Software Engineering Process, Software development phases and Software Process Models, Prototyping and RAD Model, Water fall, Incremental Model, Spiral Model,4 GT Model, Agile process model and Rational Unified Process, CASE tools.	**(07)**
Unit 2	**Planning and Managing Software projects:** People, Product, Process and Project, Measures, Metrics and Indicators, Metrics for software quality, Scope, Software Project Estimation, make by decision, Software risks - Identification, Projection, Assessment, Monitoring Project Scheduling and tracking tasks/Work break down structures, Time line charts, Project plan. **(Self-Study:** Empirical estimation model**)**	**(07)**
Unit 3	**Requirement Analysis:** Communication Techniques, FAST, Quality deployment, Analysis Principals: Modeling, partitioning Prototyping, Specification, SRS and SRS review analysis models: Data modeling, Functional modeling Information flow, Data flow Diagrams, Extension to real time systems.	**(07)**
Unit 4	**Design Fundamentals:** Software Design and software design process, principals and concepts, Abstractions, Refinement and modularity, Software architecture, Control hierarchy, Partitioning, Data structure, Information hiding, Effective modular design, Cohesion, coupling, Design Model, Design documents	**(07)**
Unit 5	**Design Methods:** Architectural design and design process, transform and transaction flow, design steps, interface design, procedural design, graphical and tabular design notations	**(05)**
Unit 6	**Software Testing Techniques and Strategies:** Software testing fundamentals, Test case design, White box testing, Black box testing, Control structure testing, Strategic approach to testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing	**(07)**

Text Books

1.	Roger S. Pressman "Software Engineering- A Practitioner's Approach" TMH, 6th Edition. (Unit 1,2,3,4,5,6)

Reference Books

1.	Rajib Mall, "Fundamentals of Software Engineering" PHI, 4th Edition.
2.	Ian Sommerville, "Software Engineering" Pearson Publication, 9th Edition.
3.	PankajJalote ,"Software Engineering : A Precise Approach" Wiley India, 3rd Edition.
4.	Kogent "Software Engineering" Wiley India, 2nd Edition.

Useful Links

1.	http://nptel.ac.in/courses/106105087 IIT Kharagpur
2.	https://nptel.ac.in/courses/106/101/106101061/ Prof. N. L. Sarda, IIT Bombay
3.	https://nptel.ac.in/courses/106/105/106105182/ Prof. R. Mall IIT Kharagpur

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	2	2	-	-	-	-	-	1	1	2	2	1	3
CO2	-	2	2	-	-	-	-	-	1	1	2	2	1	3
CO3	-	2	2	-	1	-	-	-	1	1	2	2	1	3
CO4	-	2	2	-	-	-	-	-	1	1	2	2	1	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	5	20
Understand	10	10	5	30
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad			
Third Year (Sem – VI) B. Tech. Information Technology			
IT2605 - Big Data Analytics			
Teaching Scheme		**Examination Scheme**	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	**03**	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Explain basic concepts and terminologies used in big data.
2.	Illustrate data analytics life cycle and business challenges.
3.	Discuss Hadoop technology used in the distributed environment.
4.	Select appropriate big data tools for various case studies in distributed environment.

	Course Contents	Hours
Unit 1	**Introduction:** Classification of Digital Data, Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Overview of Big Data, Other Characteristics of Data Which are not Definitional Traits of Big Data, Importance of Big Data, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, Changing in the Realms of Big Data.	**(07)**
Unit 2	**Big Data Analytics:** Big data analytics, Drivers of Big data analytics, Big Data Stack, Typical analytical architecture, Virtualization and Big Data, Virtualization Approaches, Business Intelligence Vs Data science, Applications of Big data analytics. (**Self-Study**: Crowd sourcing analytics)	**(07)**
Unit 3	**Hadoop Technology:** Introduction, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator), Interacting with Hadoop Ecosystem	**(07)**
Unit 4	**Big Data Tools:** NoSQL - Introduction, advantages, Use of NoSQL in industry, Comparison of No SQL, SQL and New SQL, HadoopVs SQL. MongoDB – Introduction, Data Types in MongoDB, MongoDB Query Language Cassandra - Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD Operations, Using a Counter, Time to Live (TTL), (**Self Study:**Alter Commands, Import and Export, Collections**)**	**(08)**
Unit 5	**MAPREDUCE Programming:** Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression	**(06)**
Unit 6	**Data warehousing and analysis tools:** Hive: Introduction, architecture of hive, data types, file format, HQL. Pig – Introduction – ETL Processing, Data Types in Pig , Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, (**Self Study:**Amazon RedShift)	**(07)**

Text Books

1.	Seema Acharya, Subhashini Chellappan , "Big Data & Analytics", Wiley Publications. (Unit:1,2,3,4,5,6)

Reference Books

1.	Tom White, "Hadoop: The Definitive Guide", O'Reilly Publications, 4th Edition, 2015, ISBN-10: 9352130677, ISBN-13: 978-9352130672.
2.	"Big Data (Black Book)", DT Editorial Services, Dreamtech Press.
3.	David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications, 2012.

Useful Links

1.	https://nptel.ac.in/courses/106/104/106104189/ Prof. R. Misra IIT, Patna

2	https://onlinecourses.nptel.ac.in/noc20_cs92/preview	Prof. R. Misra IIT, Patna
3	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs33/	Prof. R. Misra IIT, Patna

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	1	-	-	1	-	-	1	-	-	1	1	-
CO 2	2	1	1	-	-	1	-	-	1	-	-	1	1	-
CO 3	2	1	1	-	3	1	-	-	1	-	-	1	2	2
CO 4	2	3	2	1	2	-	-	1	1	-	-	1	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2606 : Internet of Things Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		CA	50
Total Credits	**01**			

Course Outcomes:	
Students will be able to:	
1	Demonstrate the program on embedded systems.
2	Make use of various communication platforms to communicate with other mobile devices.
3	Analyze estimation of the performance of the developed scalable cloud storage and execution platform for IoT on the real sensors data.

Course Contents	
Experiment 1	**Implement an Embedded Programs**
	1.1. Toggling LEDs
	1.2. Transmitting a string through UART
	1.3. Controlling LEDs blinking pattern through UART
	1.4. Echo each character typed on serial terminal.
	1.5. Digital IO configuration.
	1.6. Timer based LED Toggle.
	1.7. On-chip Temperature measurement through ADC
Experiment 2	**Implement RF experiments**
	2.1. Point-to-Point communication of two Motes over the radio frequency.
	2.2. Multi-point to single point communication of Motes over the radio frequency.
Experiment 3	**Implement an experiments on interfacing with UbiSense**
	3.1. I2C protocol study
	3.2. Reading Temperature and Relative Humidity value from the sensor.
	3.3. Reading Light intensity value from light sensor.
	3.4. Reading of atmospheric pressure value from pressure sensor.
	3.5. Proximity detection with IR LED.
	3.6. Generation of alarm through Buzzer.
	3.7. Transmitting the measured physical value from the UbiSense over the Air.
Experiment 4	**Implement an experiments on interfacing with Ubi-DAQ**
	4.1. Timestamp with RTC
	4.2. IO Expander
	4.3. Relay control.
	4.4. I2C based 12-channel ADC
	4.5. EEPROM read and write
Experiment 5	**Demonstrate WSN Applications**
	5.1. Peer-to-Peer network topology using Coordinator and end device network device types.
	5.2. Peer-to-Peer communication between Coordinator and end device through Router.
	5.3. Establishing Many-to-One Communication (Star Network Topology)
	5.4. Establishing Tree Network Topology
	5.5. Establishing Cluster Tree Network
Experiment 6	**Implement an IOT applications**
	6.1. Porting 6LoWPAN stack on Ubimote for enabling it with IPv6
	6.2. 6LoWPAN network formation with motes and PC
	6.3. IP based lighting control through Data Acquisition Card
	6.4. IP based sensor monitoring through Ubi-Sense
Requirement Tools :	**IOT Kit contains following items:**
	1. Arduino Uno Rev 3 (Made in Italy) with USB Cable
	2. ESP8266 (ESP01) Serial WiFi Module

	3. 1-Channel Relay Module
	4. Breadboard (Regular)
	5. Assorted Jumper Wires (20)
	6. LM35 Temperature Sensor
	7. Assorted LEDs (10)

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

	1.	Total number of Experiments : 6

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	-	-	-	-	-	1	-	1	-
CO2	1	1	2	1	1	1	-	1	-	2	1	1	-	1
CO3	-	2	2	-	3	1	-	1	-	-	2	-	1	1

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Avg
Task I	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05
CA	50	50	50	50	50	50	50

	Government College of Engineering, Karad				
	Third Year (Sem – VI) B. Tech. Information Technology				
	IT2607 : Big Data Analytics Lab				
Laboratory Scheme:				**Examination Scheme:**	
Practical	2 Hrs/week			CA	50
Total Credits	**01**				

Course Outcomes:

Students will be able to:

1	Discuss data analytics life cycle to address big data.
2	Experiment with Hadoop Cluster and HDFS.
3	Elaborate analytic tools and techniques to analyze big data.
4	Develop programs using various tools in big data.

Course Contents

Experiment 1	Installation and configuration of Hadoop.
Experiment 2	File Manipulation in HDFS.
Experiment 3	Implement application for counting frequency of words in a text file using MapReduce.
Experiment 4	Implementation of Matrix Multiplication using MapReduce.
Experiment 5	Implement a program to find the maximum temperature of a particular year in an input file.
Experiment 6	NoSQL database operations using MongoDB.
Experiment 7	Implement application for counting number of words in a text file using Pig.
Experiment 8	Write a script in Pig to join, group, sort and filter data.
Experiment 9	Implement the various operations on Hive. (Create, Insert, Update)
Experiment 10	Text analysis using R/ Python.
Experiment 11	Twitter data analysis with R/ Python.
Experiment 12	Sentiment analysis of whatsapp data with R/ Python

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Total number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	1	1	-	2	1	-	2	2	2	-	2	2	2
CO2	2	2	2	2	3	2	1	2	2	2	-	1	2	2
CO3	2	2	2	2	3	2	1	2	2	2	-	1	2	2
CO4	2	2	2	2	3	2	1	2	2	2	-	1	2	2

1: Slight(Low)   2: Moderate(Medium)   3: Substantial(High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2608: Advanced Software Technology Lab				
Teaching Scheme			**Examination Scheme**	
Lectures	01 Hrs/week		CA	50
Practical	02 Hrs/week		ESE	50
Total Credits	**02**			

Course Outcomes (CO):

Students will be able to

1.	Adapt the usage of modern tools and recent software.
2.	Evaluate problems and analyze data using current technologies
3.	Evaluate problems and analyze data using current technologies in a wide variety of business and organizational contexts.
4.	Incorporate best practices for building applications.

	Course Contents	**Hours**
Unit 1	**Python Basics:** Data types, Statements and Expressions, Operators and Math's, Conditionals, Loops, Strings, List, Tuples , Set Operation, Dictionary (Dict), Date and Times, Functions, Packages and Classes: Lambda function, Regular expression, Packages, Files, Exception Handling, Classes ,Objects, Method ,class and instance variable, constructor, destructor, inheritance.	**(03)**
Unit 2	**Numpy, Matplotlib, Pandas:** Array operations, Numpy Side Effects, 2D Numpy Arrays, Numpy Basic Statistics, Universal Function, Matplotlib: Simple plots, Subplots, selections and Indexing, Filling Methods, Series operation, Handling NaN values, Mapping, Data Frames, Reading Files, Plotting, Joins, Correlation, Histograms, Grouping, Aggregate Functions, pandas.IO. Data, Panel.	**(04)**
Unit 3	**Introduction to R:** Features of R, R Objects, Creating Vectors and Matrices, Getting Data in and out of R, Using different packages related to data science, Managing Data frames and Functions. Descriptive Statistics using R: Discrete and continuous random variables, densities and distributions, Data Summarization, Measures of shape and association, Outliers. (**Self- Study:** Using R for descriptive statistics and data visualization using ggplot2 package)	**(04)**
Unit 4	**Predictive Analysis using Machine Learning Techniques using R:** Machine learning - what, how, where. Supervised, unsupervised and semi-supervised learning. Training, validation, testing, generalization, over fitting. Building a Regression model using R. Features and feature engineering. Using Decision trees, Linear classifiers, Naïve Bayes, Nearest neighbour methods in R packages.	**(03)**
Unit 5	**Octave:** Getting started, Vectors and matrices, Plotting, Text and file output, General mathematical functions, Loops and conditions, Writing functions, Vectorization, Geometry, Signal Processing, Image Processing, Audio Processing	**(03)**
Unit 6	**Tableau:** Tableau basics, Connecting Tableau to a Data File - CSV File, Time series, Aggregation, and Filters, Maps, Scatter plots, and Dashboard, Joining and Blending Data, Table Calculations, Advanced Dashboards, Storytelling.	**(03)**
	Laboratory Contents:	
Experiment 1	Installation of Python and study of basics.	
Experiment 2	Implement python program that loads any dataset and plot the graph.	

Experiment 3	Implement python program that perform data cleaning on any dataset.
Experiment 4	Installation of R and study of R objects with basic statistics.
Experiment 5	Implement R Program to perform data pre-processing, analysis and visualization.
Experiment 6	Implement R program for Correlation and regression analysis.
Experiment 7	Data analysis using R for available data set. (Apply machine learning algorithm)
Experiment 8	Implement a GNU Octave program for Solving Systems of Linear Equations.
Experiment 9	Implement a GNU Octave program for Integrating Differential Equations and produce the Graphical Output of solution.
Experiment 10	Implement a GNU Octave program for solving convex hull problem and produce the Graphical Output of solution.
Experiment 11	Implement a GNU Octave program to apply Image Processing functions like load, display, represent, plot and colour.
Experiment 12	Implement a GNU Octave program to apply Audio Processing functions like record, retrieval, and audio data processing.
Experiment 13	Connecting to Database and Extracting Data in Tableau.
Experiment 14	Develop Tableau worksheet, add filters and create chart using dataset.
Experiment 15	Creating dashboard in Tableau by Adding Sheets with defining Global Filters and Layout Design.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

	Total number of Experiments : 10

Text Books

1.	Kenneth A Lambert, B.L. Juneja, "Fundamentals of PYTHON", CENGAGE Learning, ISBN:978-81-315-2903-4. (Unit:1,2)
2.	Jiawei Han, Micheline Kamber, Morgan Kaufman, "Learning R, Richard Cotton", O'Reilly, ISBN: 13:978-93-5110-286-1, 1st Edition, 2015. (Unit:3,4)
3.	Jesper Schmidt Hansen, "GNU Octave: Beginner's Guide", Packet Publishing, 1st Edition, 2011.(Unit:5)
4.	Ben Jones, "Communicating data with Tableau :designing, developing, and delivering data visualizations", "O'Reilly Media, Inc.", 2014, ISBN 1449372007.(Unit:6)

Reference Books

1.	Zed A. Shaw, "Learn PYTHON The Hard Way", Pearson, ISBN: 978-93-325-8210-1.
2.	Allen B Downey, "Think PYTHON", O'Rielly, 4th Edition, 2015, ISBN: 13:978-93-5023-863-9.

Useful Links

1.	https://nptel.ac.in/courses/106/106/106106182/ IIT Ropar
2.	https://nptel.ac.in/courses/111/104/111104100/ IIT Kanpur
3.	https://octave.org/doc/v4.2.2/index.html#SEC_ContentsGNU Octave by John Eaton
4.	wikihttp://web.archive.org/web/20070607162216/http://www.aims.ac.za/wiki/index.php/Octave AIMS
5.	https://www.youtube.com/playlist?list=PLyD1XCIRA3gQmN73dHwQWr4R08ABZFMtZ

Mapping of COs and POs:

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad
Third Year (Sem – VI) B. Tech. Information Technology
IT2609 : Programming Lab II

Laboratory Scheme:			Examination Scheme:	
Practical	2 Hrs/week		CA	25
Total Credits	**01**		ESE	25

Course Outcomes:

Students will be able to:

1	Develop web application using Java Servlet and JSP.
2	Implement hibernate applications.
3	Design a web application using Spring framework.

Course Contents

Experiment 1	Installation, Configuration of Tomcat Server and Deployment of servlet based application
Experiment 2	Develop Servlet application to demonstrate Request, Response and Session.
Experiment 3	Implement database connectivity using Java Servlet.
Experiment 4	Implement Web Application with Java Server Page (JSP).
Experiment 5	Develop JSP application using database.
Experiment 6	Implement Session management using JSP.
Experiment 7	Develop a registration form using struts UI tags and store information into the database.
Experiment 8	Develop the login and logout application using Struts framework.
Experiment 9	Develop a Web application using Hibernate framework.
Experiment 10	Write an application using Hibernate Mapping Collections.
Experiment 11	Installation of Spring Environment.
Experiment 12	Write an application to handle form data in spring MVC.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Total number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	3	2	-	-	-	-	-	-	-	-	2	1
CO2	-	3	3	2	-	-	-	-	-	-	-	-	2	1
CO3	-	3	-	-	2	-	-	-	-	-	-	-	2	1

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
IT2610 : Technical Presentation				
Laboratory Scheme:			**Examination Scheme:**	
Tutorial	1 Hr/week		CA	50
Total Credits	**01**			

Course Outcomes:

Students will be able to:

1	Understand the various contemporary technology trends in IT domain.
2	Prepare presentation and improve the communication skills.
3	Make use of the knowledge to write technical report.

Course Contents

Students should deliver technical presentation individually. It should consist of a talk of 20 minutes on a topic, preferably from the area in which a student intends to work for project in final year B. Tech or any upcoming technology not covered in the syllabus.

Selection of Technical Presentation Topic:

1.	Select a topic for technical presentation relevant to recent developments in Information Technology, Computer Science and Engineering. For selection of topics, refer reputed journal papers (IEEE Transactions, Elsevier, Springer and Wiley) and innovative ideas.
2.	Get the topic approved by the technical presentation guide well in advance.

Preparation:

1	Review the topic and find relevant information related to the topic.
2	The presentation slides should include a list of key points, figures, charts and tables. There should not be running paragraphs.
3	The slides should be readable – Font size used should be at least 20.
4	The figures, tables, etc. should be relevant to content. Figures should be very clear. Develop the habit of drawing your own figures using suitable software tools for better clarity.
5	For the presentation, adopt simple themes; avoid unnecessary animation and sound effects.
6	The presentation should be approved by the Technical Presentation guide for corrections if any.
7	A report of the Technical Presentation should contain the following. (Use LATEX tool for the report preparation). The report should comprise following points, but not limited to mentioned points.
8	a. Title of the Technical Presentation. b. Abstract of the topic. c. Name and other details of student and the guide. d. Introduction, Motivation, Reason behind selection of Seminar topic, Real-time applications, Review of similar existing methods, Pros and cons of selected topic, System model (framework), Conclusion and future scope and References. e. List of references strictly in IEEE format.

Presentation:

1.	Keep a hand-out of the presentation. This will help to organize the talk better.
2.	There should be a proper self - introduction at the beginning.
3.	Introduce the topic and highlight its significance.
4.	Have good voice projection; deliver in modest pace; modulation of voice is desirable.
5.	Keep eye contact with the audience.
6.	Face the audience – Don't talk to the screen.
7.	Familiarise with presentation aids.
8.	Avoid repeated use of certain words/gestures.

	9.	Give a proper conclusion.
Assessment Guideline:		
•		The student has to meet weekly with the guide and should maintain weekly progress report. Internal guide has to keep track of the progress of the technical presentation and also has to maintain attendance report. This progress report can be used for awarding CA marks.
•		The technical presentation to be delivered by students should be assessed by an expert panel from the department.
•		The assessment for the technical presentation should include, but not limited to following points. 1) Novelty of the topic 2) Technical depth 3) Organization of the topic 4) Presentation skills 5) Communication skills 6) Question-Answer session
•		The student will have to submit the technical presentation report.
Teaching Load:		
		One supervisor from the department shall be assigned five students for the technical presentation. The weekly load for the supervisor is 1 hour/week.
List of Submission:		
		Technical presentation report.

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	1	2	1	1	2	2	1	-	2	2	2
CO2	2	2	2	1	2	1	-	-	2	3	-	-	-	-
CO3	1	2	2	1	1	1	1	1	2	-	-	1	1	1

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
Elective-II: IT2613: Soft Computing				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Interpret soft computing schemes using knowledge of discrete mathematics, data structures and computer architectures.
2.	Demonstrate machine learning processes.
3.	Compare and analyse soft computing schemes.
4.	Create and evaluate for better schemes using soft computing.

	Course Contents	**Hours**
Unit 1	**Introduction to Soft Computing:** Concept of computing systems, Difference between Hard and Soft Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence, Neural Networks, Fuzzy Set Theory, Evolutionary Computing, Neuro-Fuzzy and Soft Computing Characteristics	**(04)**
Unit 2	**Fuzzy Logic:** Crisp Logic, Fuzzy Logic, Fuzzy Rule base and Approximate Reasoning, Defuzzification Methods, Applications	**(05)**
Unit 3	**Fundamentals of Neural Networks:** Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network Supervised Learning Network: Perceptron Network, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Radial Basis Function Network	**(12)**
Unit 4	**Unsupervised Learning Networks:** Fixed Weight Competitive Net, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Adaptive Resonance Theory Network	**(05)**
Unit 5	**Nature Inspired Meta-heuristic Algorithms:** Ant colony algorithm, Particle search optimization, Artificial Bee colony search, Bat Algorithm Genetic Algorithm: Introduction, Biological Background, Traditional Optimization and Search Techniques, Genetic Algorithm and Search Space, Generic Algorithm vs. Traditional Algorithms, Basic Terminologies in Genetic Algorithm, Simple GA, General Genetic Algorithm, Operators in Generic Algorithm, Stopping Condition, Constrains (**Self-Study:** Firefly algorithm)	**(07)**
Unit 6	**Hybrid Systems & Applications of Soft Computing:** Introduction to Hybrid Systems, Adaptive Neuro Fuzzy Inference System(ANFIS) Applications of Soft Computing: Optimization of Travelling Salesman Problem using GA, (**Self-Study:** GA Based Internet Search Technique)	**(07)**

Text Books				
1.	Jyh Shing Roger Jang, Chuen: Tsai Sun, Eiji Mizutani, "Neuro: Fuzzy and Soft Computing", Prentice Hall of India, 6th Edition, 2003. (Unit 1)			
2.	S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley, 2nd Edition, 2011. (Unit 2,3,4,5,6)			

Reference Books				
1.	S. Rajasekaran, G. A.Vijaya lakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 1st Edition, 2003.			
2.	George J. Klir, Bo Yuan, "Fuzzy Sets and Fuzzy Logic : Theory and Applications", Prentice Hall, 1995.			
3.	K. Mohan, S. Ranka, K Mehrotra, "Elements of Artificial Neural Networks", MIT Press, 1stEdition 1996.			
4.	Xin-She Yang, "Nature Inspired Metaheuristic Algorithms", Luniver Press, 2nd Edition, 2010.			

	Useful Links			
1.	http://nptel.ac.in/courses/117105084/ Prof. S. Sengupta, IIT Kharagpur.			
2.	https://ocw.mit.edu/courses/brain-and-cognitive-sciences/9-641j-introduction-to-neural-networks-spring-2005/ Prof. Sebastian Seung, MIT Massachusetts.			
3.	https://onlinecourses.nptel.ac.in/noc20_cs17/preview Prof. Debasis Samanta, IIT Kharagpur.			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	-	-	3	-	-	-	-	-	-	-	-	2
CO 2	1	-	1	1	-	-	-	-	-	-	-	-	-	2
CO 3	1	-	1	1	2	-	-	-	-	-	-	-	-	1
CO 4	3	1	1	1	3	-	-	-	-	-	-	-	1	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember			1	15
Understand	5	5	1	15
Apply	-	5	3	10
Analyse	-	5	3	10
Evaluate	5	-	2	10
Create	5	-	-	-
TOTAL	15	15	10	60

<table>
<tr><td colspan="5" align="center">**Government College of Engineering, Karad**</td></tr>
<tr><td colspan="5" align="center">**Third Year (Sem – VI) B. Tech. Information Technology**</td></tr>
<tr><td colspan="5" align="center">**Elective II: IT2623: Digital Signal Processing**</td></tr>
</table>

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Understanding the concept of Fourier transform, DFT and DTFT.
2.	Realization of FIR and IIR in different forms.
3.	Identify and apply use of Fourier Transforms in Discrete Frequency domain.
4.	Understanding of DSP Processor architecture.

	Course Contents	Hours
Unit 1	**Discrete Fourier Transform:** Introduction to DFT, Properties of DFT, Relationship between DTFT and DFT Computation methods. Linear Convolution, circular convolution, Overlap Save and Overlap add algorithm. FFT Algorithms – Radix 2: DIT-FFT and Radix 2: DIF	**(07)**
Unit 2	**FIR Filter Design:** Characteristics and Properties of FIR Filters, FIR Design using Frequency Sampling Technique and Windowing methods, Basic realization blocks diagram, FIR realization- Direct Form (Non- linear phase and Linear phase), Cascade realization. Frequency Transformation	**(07)**
Unit 3	**IIR Filters Design:** Introduction to IIR Filters, Butterworth Filter approximation and Chebyshev, IIR Filter Designing using Impulse Invariant method and Bilinear Transformation method, IIR realization- Direct form I and II, Cascade and parallel realization.	**(07)**
Unit 4	**Multi-rate and Adaptive DSP:** Introduction, Decimation and interpolation,, Design of Sampling Rate Converters, Polyphase Structures, Multistage Implementation Of Sampling Rate Conversion, Filter banks, Quadrature Mirror Filters bank, Application. Adaptive Wiener filter and LMS algorithm, (**Self Study**- Applications of adaptive filtering to echo cancellation and equalization.)	**(09)**
Unit 5	**DCT, wavelet transform and its application:** Forward DCT, Inverse DCT and DCT as orthogonal transformation. Introduction to wavelets, STFT, Continuous wavelet transform (CWT), Inverse CWT and Properties, Discrete wavelet transform, Comparison of Fourier transform & wavelet transform, Application of wavelets transforms.	**(06)**
Unit 6	**DSP Processor:** Introduction and Architecture of DSP Processor and its specifications (such as TMS, Analog DSP), Comparison between general purpose and DSP, Advantages and typical applications of DSP.	**(04)**

Text Books

1.	P. Ramesh Babu, "Digital Signal Processing", SciTech publication, 4th Edition, 2010. (Unit 1,2 & 3)
2.	Proakis, "Digital Signal Processing", TMG publication, 4th Edition, 2012.(Unit 5 & 6)
3.	Vaidyanathan, P.P., "Multirate Systems and Filter Banks", Pearson Education.(Unit 4)

Reference Books

1.	Shalivan and vallavraj, "Digital Signal Processing", TMG publication, Student Edition, 2007.
2.	E. C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing", Prentice Hall, Technology & Engineering, 3rd Edition, 2002.
3.	Ashok Ambardar, "Digital Signal Processing", Cengage learning, 1st Edition, 2009.

4.	J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson Publication, 4th Edition.			
Useful Links				
1.	https://www.youtube.com/playlist?list=PLB75F3DF81054644C R. C. Datta Roy, IIT Delhi			
2.	https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/video-lectures/ Prof. Alan V. Oppenheim			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	2	-	2	-	-	-	2	-	-	2	2	-
CO 2	3	3	-	3	-	-	-	-	-	-	-	-	3	2
CO 3	3	3	3	3	-	-	-	-	-	3	-	-	-	2
CO 4	2	2	3	2	3	2	-	-	2	2	-	-	-	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Information Technology				
Elective-II: IT2633: Data Warehousing and Data Mining				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Define foundational concepts underlying data mining.
2.	Explain data warehouse system and perform business analysis with OLAP tools.
3.	Apply data mining tools to real-world problems.
4.	Design and deploy appropriate classification and clustering techniques for data analysis.

	Course Contents	**Hours**
Unit 1	**Data Warehousing:** Introduction, Need for Data Warehouses, The Building Blocks: Defining Features, Data Warehouses and Data Marts, Overview of the Components, Metadata in the Data Warehouse; Overview of Data Extraction, Clean-up and Transformation tools.	**(06)**
Unit 2	**Dimensional Modeling and OLAP:** Dimensional Modeling Basics; The Star Schema -Dimension Table, Fact Table, Factless Fact Table, Data Granularity, Star Schema Keys, Advantages of Star Schema, The Snowflake Schema. OLAP in The Data Warehouse: Demand For OLAP; Major Features and Functions - Dimensional Analysis, Hypercubes, Drill Down and Roll Up, Slice and Dice or Rotation; OLAP Models – MOLAP, ROLAP, HOLAP.	**(07)**
Unit 3	**Data Mining:** Introduction, Kinds of Data and Patterns to be Mined, Technologies used, Applications, Major Issues in Data Mining. Know Your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.	**(07)**
Unit 4	**Mining Frequent Patterns, Associations and Correlations:** Basic Concepts: Market Basket Analysis, Frequent Itemsets, Closed Itemsets and Association Rules; Frequent Itemset Mining Methods: Apriori Algorithm, Generating Association Rules from Frequent Itemsets; Pattern Evaluation Methods: lift and $\chi 2$. (**Self study:** Data Mining for Online Retail Industry)	**(07)**
Unit 5	**Classification and Prediction:** Basic Concepts, Issues Regarding Classification and Prediction, Decision Tree: DT Induction, Attribute Selection Measures; Bayes Classification Methods: Bayes' Theorem, Naive Bayesian Classification; Rule-Based Classification: Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree. (**Self study:** Rule Induction Using a Sequential Covering Algorithm)	**(07)**
Unit 6	**Cluster Analysis:** Introduction, Requirements, Overview of Basic Clustering Methods; Partitioning Methods: k-Means, k-Medoids; Hierarchical Methods: BIRCH; Density-Based Methods: DBSCAN. (**Self study:** Evaluation of Clustering, Euclidean Distance Measure)	**(06)**

Text Books				
1.	Paulraj Ponniah , "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals", John Wiley & Sons, 2nd Edition, ISBN: 0-471-41254-6, 2001. (Unit-1,2)			
2.	Jiawei Han, Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier, 3rd Edition, 2012. (Unit-3,4,5,6)			

Reference Books				
1.	Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill, 2016.			
2.	Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 1st Edition, ISBN: 978-0130888921, 2002.			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1	1	-	2		-	-	1	-	-	1	1	1
CO 2	2	2	1	1	2	1	-	-	1	-	-	1	2	1
CO 3	3	3	2	3	2	2	2	2	3	2	2	2	3	3
CO 4	2	1	2	2	2	1	-	1	1	1	-	1	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad			
Third Year (Sem – VI) B. Tech. Information Technology			
Elective-II: IT2643: Advanced Computer Networks			
Teaching Scheme			**Examination Scheme**
Lectures	03 Hrs/week		CT – 1	15
Tutorials	--		CT – 2	15
Total Credits	**03**		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

1.	Explain client-server communication technologies and routing in the network.
2.	Demonstrate use of IPv6 and network management protocols.
3.	Analyse behaviour of various routing protocols at each layer of wireless ad-hoc network.
4.	Design different possible solutions for communications in the wireless ad-hoc network by applying knowledge of mathematics, probability and statistics.

	Course Contents	Hours
Unit 1	**TCP-IP protocol suite**: Sockets, Remote procedural call, Remote method invocation, Application layer protocols, DHCP, FTP, and TFTP	**(06)**
Unit 2	**IPv6:** IPv4 deficiencies, Patching work done with IPv4, IPv6 addressing, Multicast, Anycast, ICMPv6, Neighbour discovery, Routing.	**(07)**
Unit 3	**Network management Protocols:** SNMPv1 Network Management: Organization and Information Models, SNMPv2: Major changes, SNMPv3, RMON, Network Management Tools, Systems and Engineering, Network management applications.	**(07)**
Unit 4	**Network Layer Routing Protocols:** Issues in designing routing protocols, Classification, Table driven routing protocols, Cluster-oriented routing protocols, On-demand routing protocols, Hybrid routing protocols, **(Self Study :** Multicast routing in Ad Hoc Wireless Networks**)**	**(06)**
Unit 5	**Ad Hoc Wireless Networks:** Introduction, Cellular and wireless ad-hoc network, Issues in Wireless Ad-hoc network, Issues in designing MAC Protocols, Design goals of a MAC Protocol, Classification, Contention-based MAC protocols, MACA, MARCH (**Self Study:** BTMA, DBTMA)	**(07)**
Unit 6	**Security Protocols for Ad Hoc Wireless Networks:** Security in Ad-hoc wireless networks, Security requirements, Security attacks, secure routing protocols.	**(07)**

Text Books

1.	Behrouz A. Forouzan, "TCP/IP Protocol Suite", TMH, 4th Edition, 2009.
2.	Pete Loshin,"IPv6, Theory, Protocols and Practice", Morgan Kaufmann", 2nd Edition, 2004.
3.	Mani Subramanian, Timothy A. Gonsalves,N. Usha Rani, "Network Management: Principles and Practice" Pearson Education India, 2010.

Reference Books

1.	William Stallings, "High-Speed Networks and Internets", Pearson Education, 2nd Edition, 2002.
2.	C. Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall, 2004.
3.	Muthukumaran B, "Introduction to High Performance Networks", Tata McGraw Hill, 2008.

Useful Links

1.	https://nptel.ac.in/courses/106/105/106105160/ Prof. Sudip Mishra, IIT Kharagpur.
2.	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/ Prof. Sudip Mishra, IIT Kharagpur.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	1	-	1	-	-	-	1	-	-	-	1	-
CO 2	2	2	1	-	1	-	-	-	1	-	-	-	2	2
CO 3	1	3	-	2	1	-	-	-	-	-	-	-	2	-
CO 4	1	1	3	1	2	-	-	1	1	-	-	2	1	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60