SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ELECTRONICS and TELECOMMUNICATION ENGINEERING

CBCS Syllabus for

First Year M. Tech.

w.e.f. Academic Year 2018-19

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE of M.Tech. (ELECTRONICS and TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018 -19
Semester-I

Sr. No.	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	*T*	*P*	*Total*	*Credits (L)*	*Credits (T)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA- P Marks*	*ICA-T Marks*	*Total Marks*
1	Research Methodology & IPR	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
2	Antenna Design and Application	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
3	Soft Computing Methods	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
4	Advanced Network System	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
5	Elective I	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
6	Seminar- I	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

Note: *L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment*

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE of M.Tech. (ELECTRONICS and TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018-19
Semester-II

Sr. No.	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	*T*	*P*	*Total*	*Credits (L)*	*Credits (T)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA- P Marks*	*ICA-T Marks*	*Total Marks*
1	Advanced Internet of Things	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
2	RF Circuit Design	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
3	Artificial Intelligence & Machine Learning	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
4	Cryptography and Network Security	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
5	Elective – II	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
6	Seminar- II	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

Note : *L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment*

- Seminar I shall be delivered on a topic related to student's broad area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- Seminar II shall be delivered on a topic related to student's particular area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- **List of elective courses for semester I and II -**

Sr.	***Elective - I***	***Elective – II***
1.	Biomedical Signal Processing	Communication System Design
2.	Advanced Embedded System	Multimedia Processing
3.	Automotive Electronics	Automation and Industrial Robotics

- Courses may be added in the list of Elective I and II as and when required

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Semester-III

Sr. No.	*Subject*	*Teaching Scheme*		*Credits*			*Evaluation Scheme*			
		L	*P*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA Marks*	*Total Marks*
1	Self Learning Course	$	-	3.0	-	3.0	ISE	30	--	100
							ESE	70		
2	Open Elective Course#	3		3.0		3.0	ISE	30		100
							ESE	70		
3	Dissertation Phase I : Synopsis Submission Seminar*		@4		3.0	3.0	ISE	--	100	100
							ESE	--	--	
4	Dissertation Phase II : ICA*		-		3.0	3.0	ISE	--	100	100
							ESE	--	--	
5	Dissertation Phase II Progress Seminar*		-		3.0	3.0	ISE	--		100
							ESE	--	100	
Total		**3**	**4**	**6.0**	**9.0**	**15.0**		**200**	**300**	**500**

L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment

Note -

- $- Being a Self Learning Course, student shall prepare for examination as per specified syllabus
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- # - This course is common for all branches of Technology (ie for all M.Tech. Programs)

- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any
- @ Indicates contact hours of students for interaction with advisor.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur

List Self Learning Courses -

Sr.	***Self LearningSubject***
1	Semiconductor Device Modelling
2	Programmable System on Chip (PSoC)
3	Remote Sensing
4	Multimedia Network

List of Open Elective Courses-

Sr.	***Self LearningSubject***
1	Business Analytics
2	Operation Research
3	Cost Management of Engineering Projects
4	Non conventionalEnergy

- New Self Learning Courses and New Open Elective Courses may be added as and when required

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Four Semester Course
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Semester-IV

Sr. No.	*Subject*	*Teaching Scheme*			*Credits*			*Evaluation Scheme*		
		L	*P*	*Total*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*ICA Marks*	*Total Marks*
1	Dissertation Phase III : Progress Seminar #	-	4@	4	-	3.0	3.0	ISE	100	100
2	Dissertation Phase IV: #	-	2@	2	-	6.0	6.0	--	200	200
3	Final Submission of the Dissertation and Viva –Voce	-	-	-	-	6.0	6.0	ESE	200	200
Total		**-**	**-**	**6**	**--**	**15.0**	**15.0**	**-**	**500**	**500**

Note –

- #- For all activities related to dissertation Phase III & IV student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of Project Report to the department
- @ indicates contact hours of the student for interaction with the advisor
- Details of modes of assessment of seminar and dissertation shall be as specified in 7 (III) of PG Engineering Ordinance of Solapur University, Solapur.

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

RESEARCH METHODOLOGY and IPR

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Tutorial –1Hours/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

Unit-I – Introduction to Research: (5 Hrs)

Motivation and objectives, Research methods *vs*Methodology, Types of research – Descriptive *vs*. Analytical, Applied *vs*. Fundamental, Quantitative *vs*. Qualitative, Conceptual *vs*. Empirical.

Unit-II - Research Formulation: (8 Hrs)

Defining and formulating the research problem, Selecting the problem, Necessity of defining the problem, Importance of literature review in defining a problem, Literature review, Primary and secondary sources – reviews, treatise, monographs, patents, web as a source, searching the web, Critical literature review, Identifying gap areas from literature review, Development of working hypothesis.

Unit-III - Research Design and Methods: (8 Hrs)

Research design – Basic Principles, Need of research design, Features of good design, Important concepts relating to research design, Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models. Developing a research plan, Exploration, Description, Diagnosis, Experimentation. Determining experimental and sample designs.

SECTION-II

Unit-IV - Data Collection and Analysis: (8 Hrs)

Execution of the research, Observation and Collection of data, Methods of data collection, Sampling Methods, Data Processing and Analysis strategies - Data Analysis with Statistical Packages, Hypothesis-testing. Generalization and Interpretation.

Unit-V - Reporting and Thesis writing: (8 Hrs)

Structure and components of scientific reports, Types of report, Technical reports and thesis, Significance, Different steps in the preparation – Layout, structure and Language of typical reports/thesis, Illustrations and tables, Bibliography, referencing and footnotes, Plagiarism, Citation and acknowledgement, Reproducibility and accountability.

Unit-VI –Ethics and IPR: (5 Hrs)

Environmental impacts, Ethical issues, ethical committees, Commercialization, Copy right, royalty, Intellectual property rights and patent law, Trade Related aspects of Intellectual Property Rights, Reproduction of published material.

- **Internal Continuous Assessment (ICA)**
  ICA shall be based upon minimum 6 tutorials based upon above curriculum

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Reference Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. *An introduction toResearch Methodology*, RBSA Publishers.

2. Kothari, C.R., 1990. *Research Methodology: Methods and Techniques*. New AgeInternational. 418p.

3. Sinha, S.C. and Dhiman, A.K., 2002. *Research Methodology*, EssEssPublications.2 volumes.

4. Trochim, W.M.K., 2005. *Research Methods: the concise knowledge base*, AtomicDog Publishing. 270p.

5. Wadehra, B.L. 2000. *Law relating to patents, trade marks, copyright designs andgeographical indications*.Universal Law Publishing.

Additional References:

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. *Research Methods: AProcess of Inquiry*, Allyn and Bacon.

2. Carlos, C.M., 2000. *Intellectual property rights, the WTO and developing countries:the TRIPS agreement and policy options*. Zed Books, New York.

3. Coley, S.M. and Scheinberg, C. A., 1990, *"Proposal Writing"*, SagePublications.

4. Day, R.A., 1992.*How to Write and Publish a Scientific Paper,* CambridgeUniversity Press.

5. Fink, A., 2009. *Conducting Research Literature Reviews: From the Internet toPaper.* Sage Publications

6. Leedy, P.D. and Ormrod, J.E., 2004 *Practical Research: Planning and Design*,Prentice Hall.
7. Satarkar, S.V., 2000. *Intellectual property rights and Copy right*. EssEssPublications.

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

ANTENNA DESIGN AND APPLICATIONS

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Practical –2Hours/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

UNIT I: Antenna Arrays: (10 Hrs.)

Linear arrays, planner arrays and circular arrays. Array of two isotropic point sources, non isotropic Sources. Principle of pattern multiplication linear arrays of n elements, broadside, End-fire radiation pattern, directivity, Beam-width and null directions, array factor.

UNIT II: Micro strip Radiators: (11 Hrs.)

Introduction, Advantages and limitations of micro strip antenna, Radiation mechanism of Micro strip antenna, Various micro strip antenna configurations, feeding mechanisms, Transmission line model, cavity model and Design consideration of rectangular micro strip antenna.

SECTION –II

UNIT III: Broad banding of Micro strip Antenna: (8 Hrs.)

Effect of substrate parameter on bandwidth, selection of shape of patch, selection of feeding technique: aperture coupled, transmission line model of aperture coupled antenna, broad banding using stacked elements, broad banding using coplanar parasitic elements and design examples.

UNIT IV: Design and Analysis of Micro strip Antenna Arrays: (8 Hrs.)

Substrate characteristics for Microstrip Antenna Design, Ceramic Substrate, Semiconductor Substrate, Ferrimagnetic Substrate, Synthetic Substrate, Composite Material Substrate, Low-cost Low-loss Substrate and Desirable Substrate Characteristics for Antenna Fabrication.Parallel and series feed systems, Series feed of microstrip antenna, Mutual Coupling.

UNIT V:Antennas for special applications: (5Hrs)

Antennas design consideration for satellite communication, antenna for terrestrial mobile communication systems, Global Positioning System (GPS),WLAN (Wi-Fi),Bluetooth,Zigbee applications

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- **Internal Continuous Assessment (ICA)**

ICA shall be based upon minimum 6 laboratory experiment based upon above curriculum*using suitable* ***modeling software*** *for these experiments.*

Reference Books:

1. Antenna Theory analysis and design-Costantine A. Balanis, John Wiley publication.
2. Antennas-John D. Kraus, Tata McGraw Hill publication.
3. Antenna and wave propagation, Harish A. R., Oxford University Press.
4. Micro-strip antenna design handbook by Ramesh Garg, Prakash, Bhartia, InderBahl and ApisakIttipiboon, Artech House, Boston, London.

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

SOFT COMPUTING METHODS

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Practical –2 Hour/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION I

Unit1: Introduction **(5 hours)**

Introduction to Soft Computing, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets

Unit 2:Fuzzy Systems **(8 hours)**

Fuzzy relations, Fuzzy propositions, Fuzzy implications, Fuzzy inferences.Defuzzyfication Techniques, Fuzzy logic controller.

Unit 3:Genetic Algorithm **(8 hours)**

Concept of GA, GA Operators: Encoding,GA Operators: Selection-I GA Operators: Selection-II, GA Operators: Crossover-I, GA Operators: Crossover-II, GA Operators: Mutation

SECTION-II

Unit 4: Fundamentals of Neural Network **(8 hours)**

Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single-Layer NN System, Applications. Back-Propagation Learning, Back-Propagation Algorithm. ANN Training

Unit 5: Deep Learning **(7 hours)**

History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron.Introduction to Convolutional Neural Networks.

Unit 6: Hybrid Systems **(6 hours)**

Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms, GA Based Back Propagation Networks.

- **Internal Continuous Assessment (ICA)**

  ICA shall be based upon minimum 6 laboratory experiment based upon above curriculum using appropriate software.

Reference Books:

1. Melanic Mitchell, " An Introduction to Genetic Algorithm" (MIT Press)

2. Collelo, Lament, Veldhnizer, " Evolutionary Algorithm for Solving Multi-objective, Optimization Problems" (2nd Edition), (Springer)

3. Timothy J. Ross, " Fuzzy Logic with Engineering Applications" (Wiley)

4. Simon Haykin, " Neural Networks and Learning Machines" (PHI)\

5. Ian Goodfellow and YoshuaBengio and Aaron Courville, " Deep Learning" An MIT Press book,

http://www.deeplearningbook.org

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

ADVANCED NETWORK SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Practical –2Hours/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

UNIT I: Switching Networks: **(7Hrs)**

Switching -Packet switching -Ethernet, Token Ring, FDDI, DQDB, Frame Relay, SMDS, Circuit Switched –SONET, DWDM, DSL,Intelligent Networks –CATV, ATM –Features, Addressing Signaling & Routing,Header Structure, ATM Adaptation layer, Management control, BISDN, Internetworking with ATM.

UNIT II: DNS Techniques: **(7Hrs)**

Names for machines, Flat Namespace, Hierarchical Names, Delegation of Authority for names, Subset Authority, TCP/IP Internet domain names, official and unofficial Internet, Domain names, items named and syntax of names, mapping domain, names to addresses, domain names resolution, efficient translation caching. The key to efficiency, Domain mapping message format, compressed name format, abbreviation of domain names, inverse mappings, pointer queries, object types and resource record contents, obtaining authority for a sub domain.

UNIT III: MPLS AND VPN: **(6Hrs)**

Technology overview –MPLS &QoS, MPLS services and components –layer 2 VPN, layer 2 internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN.

SECTION- II

UNIT IV: NGN Management: **(7Hrs)**

Network Management and Provisioning –Configuration, Accounting, performance, security, case study for MPLS, Future enhancements –Adaptive self-healing networks.

Unit V: Methods of Ensuring Quality of Service: **(7Hrs)**

Methods of ensuring quality of service – introduction, applications and QoS, QoS mechanisms, Queue management algorithms, feedback, resource reservation, traffic engineering, IP QoS

Unit VI: Advanced Topics in Computer Networks: (6Hrs)

Next generation networks, cyber physical systems, smart mobiles, cards and device networks, smart devices and services, network testing, testing tool – wire shark.

- **Internal Continuous Assessment (ICA)**

  ICA shall be based upon minimum 6 laboratory experiment based upon above curriculum may be using appropriate software.

- **Reference Books**

1. Aaron Kershenbaum, " Telecommunications Network Design Algorithms ",McGraw Hill education (India) Edition 2014, ISBN: 10: 0070342288

2. James McCabe, "N/W analysis, Architecture and Design", Elsevier, 978-0-12-370480-1

3. Pablo Pavon Marino, "Optimization of Computer Networks: Modeling and algorithms – A hands on approach", Wiley Publication, ISBN: 10. 1119013356.

4. Natalia Olifer, Victor Olifer, "Computer Networks, Principles, Technologies and Protocols for network design", Wiley India, ISBN: 13, : 9788126509171

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

ELECTIVE I: BIOMEDICAL SIGNAL PROCESSING

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Tutorial–1 Hour/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

Unit1: Biomedical signal origin and dynamics: (4 Hours)

Introduction to Biomedical Signals - ECG, EEG, EMG, ENG etc. Event related potentials Biomedical Signal Analysis - Computer Aided Diagnosis. Concurrent, coupled and correlated processes - illustration with case studies

Unit 2:Signal averaging: (9 Hours)

Noise Filtering: Random noise structured noise and physiological interference- noise and artifacts in ECG. Time domain filters - Frequency domain Filters- Principles of adaptive filters - Wiener Filtering- Steepest Descent algorithms - Widrow Hoff Least mean square adaptive algorithms - Adaptive noise canceller - Interference cancellation in Electrocardiography - noise cancellation in electro surgery.

Unit 3:Cardiological signal processing: (8 Hours)

ECG data acquisition and lead system, ECG parameters and their estimation, Multi-scale analysis for parameters estimation of ECG waveforms, ECG QRS complex detection-differentiation techniques-Template matching techniques, Arrhythmia analysis monitoring, long term continuous ECG recording

SECTION-II

Unit 4: Modeling of Biomedical systems: (9 Hours)

Point processes- Parametric system modeling- All-pole, pole zero modeling, electromechanical models of signal generation. Analysis of non stationary signals: Characterization- Fixed

segmentation- Short Time Fourier Transform-Adaptive segmentation Adaptive filters for segmentation- RLS and Lattice Filter.

Unit 5: Introduction to medical image processing and visualization: (5 Hours)

Human vision and perception, Two-dimensional Fourier transform, 2-D Convolution, 2-D filters, Image enhancement, Feature extraction, Edge detection.

Unit 6: Advancement in Healthcare: (7 Hours)

Introduction to CT, MRI, PET and SPECT, tumor types and their therapy, magnetic resonance imaging.Advancement in healthcare technologies. Case studies of biomedical signal and image processing.

- **Internal Continuous Assessment (ICA)**

ICA shall be based upon minimum 6 tutorials based upon above curriculum.

REFERENCES:

1. D.C. Reddy, "Biomedical Signal Processing: Principles and techniques", Tata McGraw Hill, New Delhi, 2005.
2. Rangaraj M. Rangayyan, "Biomedical Signal Analysis: A case study Approach", Wiley Interscience 2002. 24 References
3. MetinAkay, "Biomedical Signal Processing", Academic press, Inc. California,1994
4. Bruce, "Biomedical Signal Processing & Signal Modeling," Wiley, 2001
5. Semmlow, Marcel Dekker "Biosignal and Biomedical Image Processing", 2004
6. Enderle, "Introduction to Biomedical Engineering," 2/e, Elsevier, 2005
7. Tompkins W J "Biomedical Signal Processing", Prentice hall of India, New Delhi, 1999
8. Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.
9. Arnon Cohen "Biomedical Signal Processing" CrcPr I Llc; 2nd edition, May, 2002.

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

ELECTIVE I: ADVANCED EMBEDDED SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Tutorial–1 Hour/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION I

UNIT I: Embedded Architecture: (05 Hrs)

Embedded computers, characteristics of embedded computing applications, challenges in embedded computing system design, embedded memories, embedded system design process, designing hardware and software components.

UNIT II: Embedded Processor: (06 Hrs)

ARM11, About the processor Extensions to ARMv6, MP11 CPU overview, Debug and programming support, Power ,Configurable options ,Pipeline stages ,Typical pipeline operations, MP Core architecture with Jazelle technology, Parity checking support, Product revisions.

UNIT III: Programmers Model & Control Processor: (10 Hrs)

About the programmers model, Processor operating states, Instruction length, Data types, Memory formats, Addresses in an MP Core system, Operating modes, Registers, The program status registers, Exceptions, Control Coprocessor CP15, CP15 registers arranged by function, Summary of control coprocessor CP15 registers and operations, register descriptions, Summary of CP15 instructions.

SECTION- II

UNIT IV: Embedded System Software: (07 Hrs)

Software architectures, Software Developments Tools, programming concepts, Embedded Programming in C and C++, queues, stacks, optimization of memory needs, program modeling concepts, software development process life cycle and its model, software analysis, design and maintenance.

UNIT V: Real Time Operating Systems: (07 Hrs)

Real time operating systems (µC/OS)- real-time software concepts, kernel structure, task management, time management, inter task communication & synchronization, memory management, and porting µCos-II; Linux/RT Linux- features of Linux, Linux commands, file manipulations, directory, pipes and filters, file protections, shell programming, system programming, RT Linux modules, POSIX Threads, mutex management, semaphore management.

UNIT VI: Raspberry Pi : **(07 Hrs)**

Introduction to Raspberry Pi, ARM 11 Microcontroller Hardware Description & Interfacing Components, Hardware Interfacing of PI (HDMI Port, Keyboard mouse connection, 3.5mm audio jack, micro usb power cable) Programming the GPIO of Raspberry Pi, LCD interfacing.

- **Internal Continuous Assessment (ICA)**

  ICA shall be based upon minimum 6 tutorials based upon above curriculum .

Reference books:

1. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India
2. Embedded Real Time Systems-Concepts, Design & Programming, Dr. K.V.K.K. Prasad, Dreamtech Publication
3. ARM11 MPCore ™ Processor Revision: r2p0 , Technical Reference Manual
4. Introduction to Embedded Systems, Jonathan W. Valvano ,Cengage 2009.
5. Getting Started with Raspberry Pi By Matt Richardson, Shawn Wallace.
6. ARM System Developer's Guide, Sloss, Symes, Wright, Morgan, Kaufmann, 2004, 1st Edition
7. An Embedded Software Primer, David E. Simon, Pearson Education Publication.
8. ARM920T Technical Reference Manual (Rev 1) - ARM DDI 0151C, Data books of ARM7/ARM9 J., ARM Company Ltd.
9. Embedded Systems Architecture: A Comprehensive Guide for Engineers and programmers, By Tammy Noergaard

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-I

ELECTIVE I: AUTOMOTIVE ELECTRONICS

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	ESE- 70 Marks
Tutorial–1 Hour/week, 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION I

Unit I: Fundamentals of Automotive Electronics: **(5Hrs)**

Embedded system, Embedded RTOS, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control.

Unit II: Communication Protocols: **(8Hrs)**

Introduction to control networking – Communication protocols in embedded systems – SPI, I2C, USB. Vehicle communication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000.

Unit III: Sensors & Actuators: **(8Hrs)**

Introduction; Basic sensor arrangement; Types of Sensors oxygen sensors, Crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, altitude sensors, flow Sensors, throttle position sensors, solenoids, stepper motors, relays.

SECTION II

Unit IV: Digital Engine Control System: **(8Hrs)**

Open loop and closed loop control system; engine cooling and warm-up control; acceleration, deceleration and idle speed control; integrated engine control system; exhaust emission control engineering; on-board diagnostics; future automotive electronic systems.

Unit V: Automotive Electrical: **(5Hrs)**

Batteries; starter motor & drive mechanism; D.C. generator and alternator; regulation for charging; lighting design; dashboard instruments; horn, warning system and safety devices.

Unit VI:Automotive Applications: (8Hrs)

Body electronics – Infotainment systems – Navigation systems – System level tests – Software calibration using engine and vehicle dynamometers – Environmental tests for electronic control unit - Application of Control elements and control methodology in automotive System.

- **Internal Continuous Assessment (ICA)**

  ICA shall be based upon minimum 6 tutorials based upon above curriculum

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Reference Books:

1. Denton T , "Automobile Electrical and Electronic Systems", Elsevier Jordan Hill, Oxford, 2010.
2. BOSCH Automotive Handbook, Bentley Publications, Massachusetts Avenue, London, 2010.
3. Knowles D, "Automotive Electronic and Computer Controlled Lgnition Systems", Prentice Hall Publications, New Jersey, 2009.
5. Ronald K J, "Automotive Electronics Handbook", McGraw Hill Publications, Columbus, 2009.
6. Nicholas Navit, "Automotive Embedded System Handbook", CRC Press Publications, New Delhi, 2008.

Solapur University, Solapur

M.Tech. (Electronics & Telecommunication Engg.) Semester-II

ADVANCED INTERNET OF THINGS

Teaching Scheme:
Lecture: 3 Hrs./week ,Credits:3
Practical: 2 Hrs./week,Credit: 1

Examination Scheme:
ISE: 30 Marks
ESE: 70Marks
ICA:25 Marks

SECTION I

Unit 1 - Introduction to Internet of Things **[05 hrs]**

Introduction to IoT, different components of an IoT system: embedded systems, sensors, communication systems, cloud, applications of IoT in various domains.

Unit 2 – Industrial Internet of Things (IIoT) **[06 hrs]**

IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories.

Unit 3 – Introduction to ARM **[10 hrs]**

Introduction to ARM architecture, cortex series classification (A, R, M series), ARM Cortex-M series family, ARM Cortex-M3 processor overview, block diagram, registers, memory map, instruction set: data accessing, processing, arithmetic, basic embedded C programs for on-chip peripherals, interfacing I/O devices like LEDs, switch's etc., serial communication, analog interfacing and data acquisition, concepts of application programming interface (API).

SECTION II

Unit 4 – Communication technologies for IoT **[08 hrs]**

Basics of the communication technologies like Bluetooth Low Energy (BLE), Zigbee, Wifi, RFID,their architecture, characteristics, limitation, power consumption parameters and applications

Unit 5 - Application protocols for IoT **[08 hrs]**

Basics of application protocols like MQTT and CoAP, their features, framework, message formats,implementations and applications

Unit 6 - Cloud platforms for IoT **[05 hrs]**

Cloud architecture for IoT, concept of APIs, survey of various IoT cloud platforms,understanding the costing structure of cloud for IoT services, performance metrics for cloud platforms in IoT

Internal Continuous Assessment:

ICA shall be based upon minimum six experiments based upon above curriculum.

Text Books

1. Internet of Things by Raj Kamal
2. The Definitive Guide to the ARM Cortex-M3 by Joseph Yiu
3. Internet of Things for Architects by Perry Lea
4.Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0 by Giacomo Veneri and Antonio Capasso
5. Practical Industrial Internet of Things Security: A practitioner's guide to securing connected industries by Sravani Bhattacharjee,
6. Analytics for the Internet of Things (IoT) by Andrew Minteer
7. Embedded Systems Fundamentals with ARM Cortex-M based Microcontrollers: A Practical Approach, Embedded Systems Fundamentals with ARM Cortex-M based Microcontrollers: A Practical Approach, Alexander G. Dean

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Reference Books

1. Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies by Dimitrios Serpanos, Marilyn Wolf
2. Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by MaciejKranz, Wiley Publication
3. MQTT Essentials - A Lightweight IoT Protocol by Gaston C. Hillar
4. Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3 by Peter Waher.
5. Designing Embedded Systems and the Internet of Things (IoT) with the ARM mbed by Perry Xiao

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M.Tech. (Electronics & Telecommunication Engineering) Semester-II

RF AND MICROWAVE CIRCUIT DESIGN

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Practical - 2 Hrs. /week ,1 Credit	ISE- 30 Marks
	ICA – 25Marks

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SECTION I

UNIT I: Two port Network **(6Hrs)**

Two-Port Parameters, S-Parameters, S-Parameters from Spice Analysis, Stability, Power Gains, Voltage Gains and Current Gains, Derivation of Transducer Power Gain and Differential S-Parameters

UNIT II : Active RF Components **(8Hrs)**

RF Diode Characteristics – Schottky Diodes and Detectors, PIN Diodes and Control Circuits, Varactor Diodes, Other Diodes RF Transistor Characteristics – Field Effect Transistors (FETs), Bipolar Junction transistors (BJTs)

UNIT III : Microwave Amplifier Design **(8Hrs)**

Introduction, Single-Stage Amplifier Design- Design for Maximum Gain (Conjugate Matching), Design for Specified Gain, Low – Noise Amplifier Design, Power Amplifier Design – Characteristics of Power Amplifiers and Amplifier Classes, Large Signal Characterization of Transistors, Design of Class A Power Amplifiers.

SECTION II

UNIT IV: Microwave Oscillator design **(8Hrs)**

Two-Port Oscillator Design, Negative Resistance from Transistor Model, Oscillator Q and Output power, Transistor Oscillator Design

UNIT V: Filter Design **(6Hrs)**

Introduction, Periodic Structures, Filter Design- Image-Parameter Method, Insertion-Loss Method, Filter Implementation- Richard's Transformation, Kuroda's Identities.

UNIT VI: Monolithic Microwave Integrated Circuits & Technology **(6Hrs)**

Introduction, History of Monolithic Microwave Integrated Circuits, Materials, Fabrication techniques of MMIC.

List of Experiments:

Design and simulation of any one microwave device such as Directional coupler, Magic-Tee, Microwave filters etc; and Analysis of S-parameter, Power Gain, Input Impedance of the respective device using any microwave simulation software as HFSS, FEKO, IE3D

Internal Continuous Assessment:

ICA shall be based upon minimum six experiments based upon above curriculum.

Reference Books:

1. Microwave Engineering- David M. Pozar (John Wiley & Sons)
2. RF circuit design, theory & applications- Reinhold Ludwig, Pavel Bretchko, (Pearson Education – LPE)
3. Microwave Devices and Circuits- Samuel Y. Liao, (PHI)
4. Microwave Devices & Circuit Design-Gupta &Shrivastava(PHI)
5. Microwave Circuit Design - George D. Vendelin, Anthony M. Pavio & Ulrich L. Rehde John Wiley & Sons publication
6. Radio Frequency and Microwave Electronics - Matthew M. Radmanesh, Pearson Education Asia publication

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M.Tech. (Electronics and Telecommunication Engineering) Semester-II

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Tutorial - 1 Hr. /week , 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

Unit1: Introduction **(4Hrs)**

Introduction to Artificial Intelligence, intelligent agents, agent function, agent types.

Unit 2: Search Methods **(8Hrs)**

Problem representation, uninformed search, heuristic search techniques, constraint satisfaction problems by search, stochastic search methods. AI in games.

Unit 3: Knowledge representation and Reasoning **(8Hrs)**

Propositional logic, prepositional and predicate calculus, first order logic, Planning, Uncertain Knowledge and Reasoning, Probabilities.

SECTION-II

Unit 4: Introduction to Machine learning **(4Hrs)**

Introduction to Machine Learning, Supervised Learning, Unsupervised Learning

Unit 5: Learning **(8Hrs)**

Linear and Logistic Regression, Learning via Probabilistic Modeling-Bayesian Learning, Learning Maximum-Margin Hyperplanes: Support Vector Machines, Decision Trees. Linear Dimensionality Reduction: Principal Component Analysis

Unit 6: Clustering **(8Hrs)**

Data Clustering, K-Means, Gaussian Mixture Models, Expectation Maximization (EM), Ensemble Methods.

Internal Continuous Assessment:

ICA shall be based upon minimum six experiments based upon above curriculum.

Reference books:

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 2nd Ed, Prentice Hall, 2003
2. E. Rich and K. Knight, Artificial Intelligence, McGraw Hill, 1991.
3. I. Bratko, Prolog Programming for Artificial Intelligence, 3rd Ed, Addison-Wesley, 2001.
4. Christopher Bishop, Pattern Recognition and Machine Learning. First Edition, Springer, 2006.
5. Richard Duda, Peter Hart and David Stock, Pattern Classification. Second Edition, Wiley-Interscience, 2000.
6. Tom Mitchell, Machine Learning. First Edition, McGraw-Hill, 1997.

Solapur University, Solapur

M.Tech. (Electronics and Telecommunication Engineering) Semester-II

CRYPTOGRAPHY & NETWORK SECURITY

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Tutorial - 1 Hr. /week , 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION I

Unit 1.Overview **(6Hrs)**

Services, Mechanisms, and attacks, The OS I Security Architechure. A model for network security, Cassical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Mechines, Steganography

Unit 2. Block Ciphers and the Data Encryption Standard **(10Hrs)**

Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation, Contemporary symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, Confidentially using symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation

Unit 3. Public Key Cryptography and RSA **(5Hrs)**

Principles of Public Key cryptosystems, The RSA Algorithm, Key Management, other Public Key Cryptosystems key Management, Diffle-Hellman Key exchange.

SECTION II

Unit 4.Message Authentication and hash functions **(5Hrs)**

Authentication Requirements, Authentication Function, Message Authentication Cod
es, Hash Functions, Security of Hash Functions and MACs.

Unit 5.Hash Algorithms **(4Hrs)**

MD5 Message Digest Algorithm, Secure Hash Algorithm.

Unit 6.Authentification Applications **(4Hrs)**

Kerberos, X. 509 Authentication Service.

Unit 7.Electronic Mail Security **(3Hrs)**

Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Architecture, Authentifications, Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

Unit 8.Web Security **(3Hrs)**

Web Security Considerations, System Security: Intruders, Malicious Software, Viruses, Viruses and Related Threats, Firewalls: Firewall Design Principles.

Internal Continuous Assessment:

ICA shall be based upon minimum six tutorials based upon above curriculum.

Reference Books:

1.Willam Stallings, Cryptography and Network Security , Third Edition, Pearson Education
2.Cbarlie Kaufman, Radia Perlman, Mike Speciner, Network Security, Provate Communication in a public world, Second Edition, Pearson Education Asia, 2002.
3.Atul Kahate, Cryptography and Network Security, Tata McGrawhill, 2003.

Solapur University, Solapur

M.Tech. (Electronics and Telecommunication Engineering) Semester-II

ELECTIVE-II COMMUNICATION SYSTEM DESIGN

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Tutorial - 1 Hr. /week , 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

UNIT I: Introduction to communication systems (8 Hrs.)

Elements of an Electrical Communication System, Communication Channels and Their Characteristics, Mathematical Models for Communication Channels, Introduction to Modulation, Amplitude Modulation (AM), Angle Modulation: FM,PM, Radio and Television Broadcasting: AM Radio Broadcasting, FM Radio Broadcasting, Television Broadcasting, Mobile Radio Systems

UNIT II: Information sources and source coding: (8 Hrs)

Modeling of Information Sources, Source-Coding Theorem, Source-Coding Algorithms, Rate-Distortion Theory, Quantization, Waveform Coding, Analysis-Synthesis Techniques, Digital Audio Transmission and Digital Audio Recording, The JPEG Image-Coding Standard

UNIT III: Channel capacityand coding: (6 Hrs)

Modeling of Communication Channels, Channel Capacity, Bounds on Communication, Coding for Reliable Communication, Linear Block Codes, Cyclic Codes, Convolutional Codes

SECTION-II

UNIT IV: Communication Antennas: (6Hrs)

Introduction, Wires and patches, Dipole antenna, Yagi-Uda antennas, Microstrip antenna, Travelling wave antennas Helical antennas, Biconical antennas Sleeve antennas, and Principles of frequency independent antennas, Spiral antennas, and Log - periodic antennas

UNIT V: Antenna Synthesis: (8 Hrs)

Techniques for evaluating gain, Reflector antennas - Parabolic reflector antenna principles, Axi-symmetric parabolic reflector antenna, Offset parabolic reflectors, Dual reflector antennas, Gain calculations for reflector antennas

Formulation of the synthesis problem, Synthesis principles, Line sources shaped beam synthesis, Linear array shaped beam synthesis, Fourier series, Woodward - Lawson sampling method.

UNIT VI: MIMO Antennas: (8 Hrs)

Introduction to space time diversity, MIMO channel, MIMO information theory, Error probability analysis, Transmit diversity and space time coding, Linear STBC design, Differential coding for MIMO, Precoding, Multiuser MIMO

Internal Continuous Assessment:

ICA shall be based upon minimum six tutorials based upon above curriculum.

Reference books:

1. C. A. Balanis, **"Antenna Theory Analysis and Design"**, John Wiley, 2nd edition, 1997.
2. J. D. Kraus, **"Antennas"**, McGraw Hill TMH, 3rd/4th edition.
3. Stutman and Thiele, **"Antenna theory and design"**, 2nd edition John Wiley and sons Inc.
4. Sachidnanda et al, **"Antennas and propagation"**, Pearson Education.
5. John G. Proakis, **"Digital Communication"**, McGraw Hill, 4th edition, 2001.
7. Simon Haykin, **"Digital communications",** John Wiley and Sons.
8. E. G. Larsson and P. Stoica, **Information Theory**, Space- Time Block Coding for Wireless Communications, Cambridge University Press, 2003.
9. A. Paulraj, R. Nabar and D. Gore, **Introduction to Space- Time Wireless Communications**, Cambridge Univ. Press, 2003.

Solapur University, Solapur

M.Tech. (Electronics and Telecommunication Engineering) Semester-II

ELECTIVE-II MULTIMEDIA PROCESSING

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Tutorial - 1 Hr. /week , 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION-I

Unit I: Introduction to multimedia and data representation: (8Hrs)

Introduction to multimedia: what is multimedia, multimedia and hypermedia, world wide web, overview of mu1timedia software tools, fundamentals of audio, image and video processing, graphics and image data representations: graphics image data types, popular file formats, color in image and video: color science, color models in images, color models in video, fundamental concepts in audio and video

Unit II: Multimedia data compression: (6Hrs)

Lossless compression algorithms: introduction, basics of information theory, run-length coding, variable-length coding (VLC), dictionary-based coding, arithmetic coding, lossless image compression,

Unit III: Lossy compression algorithms: (8Hrs)

Introduction, distortion measures, the rate-distortion theory, quantization, transform coding, wavelet-based coding, wavelet packets, embedded zero tree of wavelet coefficients, set partitioning in hierarchical trees (SPIHT)

SECTION-II

Unit IV: Image compression standards: (6Hrs)

The JPEG Standard, JPEG2000 standard, JPEG-LS standard, bilevel image compression standards,

Unit V: Basic video compression techniques: (7Hrs)

Introduction to video compression, video compression based on motion compensation, H.261, H.263, MPEG video coding I - MPEG-1 and 2: overview, MPEG-1, MPEG-2

Unit VI: Multimedia communication and retrieval: (8hrs)

Computer and multimedia networks: basics of computer and multimedia networks, multiplexing technologies, LAN and WAN, access networks, common peripheral interfaces. content-based retrieval in digital libraries: - how should we retrieve images, C-BIRD - a case study, synopsis of current image search systems

- **Internal Continuous Assessment (ICA)**

  ICA shall be based upon minimum six tutorials based upon above curriculum

References:

1. Zi-Niam Li and Mark Drew, Fundamentals of Multimedia, Pearson, 2004.
2. Khalid Sayood, Data Compression, PHI.

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M.Tech. (Electronics and Telecommunication Engineering) Semester-II

ELECTIVE-II AUTOMATION AND INDUSTRIAL ROBOTICS

Teaching Scheme	**Examination Scheme**
Lectures –3 Hrs./week, 3 Credits	ESE- 70 Marks
Tutorial - 1 Hr. /week , 1 Credit	ISE- 30 Marks
	ICA – 25Marks

SECTION- I

Unit I: Introduction **(4 Hrs)**

Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations. Production Economics: Methods of Evaluating Investment Alternatives, Costs in Manufacturing, Break-Even Analysis, Unit cost of production, Cost of Manufacturing Lead time and Work-in-process.

Unit II: PLC **(4Hrs)**

Introduction- Programmable Logic controller, Ladder Logic, Programming, PLC connection, Ladder Logic Inputs , Ladder Logic outputs, PLC Hardware- I/O, relay, electric wiring. Logical sensors & actuators.

Unit III: PLC Operation **(4Hrs)**

Operation Sequence, plc status, memory types, software based PLCs, ladder logic functions, advanced ladder logic functions.

Unit IV: Introduction to SCADA **(4Hrs)**

Introduction to Wide Area SCADA System, SCADA System Hardware, SCADA System Software, Communication Protocols, Serial Communications for SCADA Systems, LAN/WAN Communication for SCADA Systems

SECTION-II

Unit V: Introduction **(3 Hrs)**

Definition of Robot & Robotics, Types of industrial robot and their methods of operation, Methods of teaching and programming, Types of controller and program memory, Analysis and control

Unit VI: Actuators & sensors for robots **(6 Hrs)**

Pneumatic & Hydraulic actuation, Hydrostatic circuits, Electric actuation, Mechanical transmission methods, Sensors for Joint angle, Joint angular velocity , Rectilinear position , Force and torque, Proximity sensing and range measurement , touch sensing & Vision

Unit VII: Control, Programming and Intelligence **(6 Hrs)**

Design of Robot Controllers, Motion Planning and Control of Robots, Intelligent Control of Robot Mobility, On-line & offline Programming, Neuro-fuzzy Systems

Unit VIII: Applications of Industrial Robots **(3 Hrs)**

Machine loading, Pallet loading and unloading, Investment casting, Spot welding , Arc welding, Spraying (paint, enamel, epoxy resin and other coatings), Fettling (grinding, chiselling), polishing, Cutting, Inspection, Mobile robots, Robotics and artificial intelligence

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Internal Continuous Assessment:

ICA shall be based upon minimum six tutorials based upon above curriculum.

Text & Reference Books:

1. "Automation, Production Systems and Computer Integrated Manufacturing"- .P.Grover, Pearson Education
2. " Automating Manufacturing system with PLC", Hugh Jack, Edition4, 2005
3. "Practical SCADA Systems for Industry", IDC technologies
4. **"**Fundamentals of Robot Technology" , D J Todd, Kogan Page Ltd
5. **"**Handbook of Industrial Robotics", Shimon Y. Nof, John Wiley & Sons