

COURSE SCHEME  
EXAMINATION SCHEME  
ABSORPTION SCHEME  
&  
SYLLABUS

Of

First, Second, Third & Fourth Semester  
Choice Base Credit System (CBCS)

Of

Master of Technology (M.Tech)

In

Wireless Communication and Computing (WCC)

*Of*

RASHTRASANT TUKDOJI MAHARAJ  
NAGPUR UNIVERSITY, NAGPUR

**Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur**  
**Faculty of Engineering & Technology**  
**Course and Examination Scheme of Master of Technology**  
**Choice Base Credit System(CBCS)**

**I Semester M. Tech. Wireless Communication and Computing (WCC)**

Subject Code	Subject	Teaching Scheme		Examination Scheme									
				Theory						Practical			
		Hours per week		No. of Credits	Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment			University Assessment	College Assessment		
PGWCC101T	Ad-hoc Wireless Network	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC102T	TCP/IP and Internet	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC103T	DSP Processors and Architectures	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC104T	Elective –I (Discipline Specific)	4	-	4	3	70	30	100	50	-	-	-	-
PGOPEN105T	Elective –II (Open)	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC106P	Laboratory –I (HPCA)	-	2	1	-	-	-	-	-	50	50	100	50
PGWCC107P	Laboratory –II (AhWN)	-	2	1	-	-	-	-	-	50	50	100	50
<b>Total</b>		20	4		-	350	150	500	-	100	100	200	-
<b>Semester Total</b>		24		22	700 Marks								

**Elective –I** (Discipline Specific) PGWCC104/1T- **Multimedia Communication**, PGWCC104/2T- **Object Oriented Systems**  
**Elective –II** (Open) PGOPEN105/1T-**Mobile Computing**, PGOPEN105/2T-**Biometric Technologies and Applications**

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**II Semester M. Tech. Wireless Communication and Computing (WCC)**

Subject Code	Subject	Teaching Scheme		No. of Credits	Examination Scheme								
		Theory				Practical							
		Hours per week	Duration of Paper (Hrs.)		Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	
L	P			University Assessment	College Assessment	University Assessment			College Assessment				
PGWCC201T	Advanced Data Structure and Algorithms	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC202T	Network Security and Cryptography	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC203T	Advance Digital Image Processing	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC204T	Elective –III (Discipline)	4	-	4	3	70	30	100	50	-	-	-	-
PGFD205T	Foundation Courses -I	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC206P	Laboratory –III (NSC)	-	2	1	-	-	-	-	-	50	50	100	50
PGWCC207P	Laboratory –IV (ADSA)	-	2	1	-	-	-	-	-	50	50	100	50
<b>Total</b>		20	4		-	350	150	500	-	100	100	200	-
<b>Semester Total</b>		24		22	700 Marks								

**Elective –III (Discipline Specific) PGWCC204/1T-Signal Processing and Smart Antennas for Wireless Communication, PGWCC204/2T-Satellite Communication**  
**Foundation Courses –I PGFD205T -Research Methodology**

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**III Semester M. Tech. Wireless Communication and Computing (WCC)**

Subject Code	Subject	Teaching Scheme		Examination Scheme									
				Theory						Practical			
		Hours per week		No. of Credits	Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment			University Assessment	College Assessment		
PGOPEN301T	Elective –IV (Open)	4	-	4	3	70	30	100	50	-	-	-	-
PGFD302T	Foundation Courses -II	4	-	4	3	70	30	100	50	-	-	-	-
PGWCC303P	Project Seminar	-	-	8	-	-	-	-	-	-	200	200	100
<b>Total</b>		8	-	-		140	60	200	-	-	200	200	-
<b>Semester Total</b>		8		16	400 Marks								

Elective –IV (Open) PGOPEN301/1T-Wireless communication and Network, PGOPEN301/2T-Mobile Application Development  
 Foundation Courses –II PGFD302T-Project planning and Management

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**IV Semester M. Tech. Wireless Communication and Computing (WCC)**

Subject Code	Subject	Teaching Scheme		Examination Scheme									
				Theory					Practical				
		Hours per week		No. of Credits	Duration of Paper (Hrs.)	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks	Max. Marks	Max. Marks	Total Marks	Min. Passing Marks
		L	P			University Assessment	College Assessment			University Assessment	College Assessment		
PGWCC401P	Project	-	-	16	-	-	-	-	-	400	-	400	200
<b>Total</b>		-	-		-	-	-	-	-	400	-	400	-
<b>Semester Total</b>		-		16	400 Marks								

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**Absorption Scheme**

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters

**I Semester**

**M. E.**

**in**

**Wireless Communication & Computing**

**Table-1**

<b>Subject Code (OLD)</b>	<b>Subject (OLD)</b>		<b>Subject Code (NEW)</b>	<b>Subject (NEW)</b>	
PG-WCC1-01	Wireless Communication And Computing		PGWCC101T	Ad-hoc Wireless Network	
PG-WCC1-02	TCP/IP And Internet		PGWCC102T	TCP/IP and Internet	
PG-WCC1-03	Digital Signal Processing		PGWCC103T	DSP Processors and Architectures	
PG-WCC1-04-01	(Elective -I) Object Oriented Systems		PGWCC104/2T	Elective –I (Discipline Specific) Object Oriented Systems	
PG-WCC1-04-02	(Elective -I) Distributed Computing		-----	-----	
PG-WCC1-04-03	(Elective -I) Multimedia Communication		PGWCC104/1T	Elective –I (Discipline Specific) Multimedia Communication	
PG-WCC1-05-01	(Elective -II) Soft Computing		-----	-----	
PG-WCC1-05-02	(Elective -II) Mobile And Adaptive Systems		-----	-----	
PG-WCC1-05-03	(Elective -II) Design And Modeling Of Mobile Protocols		-----	-----	
PG-WCC1-06	Computer System Lab.-I		-----	-----	
PG-WCC1-07	Seminar-I		-----	-----	

**Table-2**

<b>Subject Code (NEW)</b>	<b>Subject (NEW)</b>		<b>Subject Code (OLD)</b>	<b>Subject (OLD)</b>	<b>Remark</b>
PGWCC101T	Ad-hoc Wireless Network		-----	-----	Have to appear New PGWCC101T
PGWCC102T	TCP/IP and Internet		PG-WCC1-02	TCP/IP And Internet	PG-WCC1-02 Not Clear Have to appear New PGWCC102T
PGWCC103T	DSP Processors and Architectures		-----	-----	Have to appear New PGWCC103T
PGWCC104/1T	Elective –I (Discipline Specific) Multimedia Communication		PG-WCC1-04-03	(Elective -I) Multimedia Communication	If you Have Clear old PG-WCC1-04-03 Then don't appear PGWCC104T Otherwise Have to appear New PGWCC104T Elective –I (Discipline Specific)
PGWCC104/2T	Elective –I (Discipline Specific) Object Oriented Systems		PG-WCC1-04-01	(Elective -I) Object Oriented Systems	If you Have Clear old PG-WCC1-04-01 Then don't appear PGWCC104T Otherwise Have to appear New PGWCC104T Elective –I (Discipline Specific)
PGOPEN105T	Elective –II (Open)		-----	-----	Have to appear
PGWCC106P	Laboratory –I (HPCA)		-----	-----	Have to appear
PGWCC107P	Laboratory –II (AhWN)		-----	-----	Have to appear

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters  
**II Semester**  
**M. E.**  
**in**  
**Wireless Communication & Computing**

**Table-1**

<b>Subject Code (OLD)</b>	<b>Subject (OLD)</b>		<b>Subject Code (NEW)</b>	<b>Subject (NEW)</b>	
PG-WCC2-01	Advances In Algorithms		PGWCC201T	Advanced Data Structure and Algorithms	
PG-WCC2-02	Network Security And Cryptography		PGWCC202T	Network Security and Cryptography	
PG-WCC2-03	Real Time Operating Systems For Embedded Systems		-----	-----	
PG-WCC2-04-01	Elective-3 DSP Processors And Architectures		-----	-----	
PG-WCC2-04-02	Elective-3 Signal Processing And Smart Antennas For Wireless Communication		PGWCC204/1T	Elective –III (Discipline) Signal Processing and Smart Antennas for Wireless Communication	
PG-WCC2-04-03	Elective-3 Principles Of Embedded Networked System Design		-----	-----	
PG-WCC2-05-01	Elective-4 Embedded Software Design		-----	-----	
PG-WCC2-05-02	Elective-4 Satellite Communication		PGWCC204/2T	Elective –III (Discipline) Satellite Communication	
PG-WCC2-05-03	Elective-4 Digital Image Processing		PGWCC203T	Advance Digital Image Processing	
PG-WCC2-06	Computer System Lab.- II		-----	-----	
PG-WCC2-07	Seminar-II		-----	-----	
PG-WCC2-08	Comprehensive Viva-Voce		-----	-----	



**Table-2**

<b>Subject Code (NEW)</b>	<b>Subject (NEW)</b>		<b>Subject Code (OLD)</b>	<b>Subject (OLD)</b>	<b>Remark</b>
PGWCC201T	Advanced Data Structure and Algorithms		PG-WCC2-01	Advances In Algorithms	PG-WCC2-01Not Clear Have to appear New PGWCC201T
PGWCC202T	Network Security and Cryptography		PG-WCC2-02	Network Security And Cryptography	PG-WCC2-02Not Clear Have to appear New PGWCC202T
PGWCC203T	Advance Digital Image Processing		PG-WCC2-05-03	Elective-4 Digital Image Processing	PG-WCC2-05-03 Elective-4 (Digital Image Processing) Not Clear Have to appear New PGWCC203T
PGWCC204/1T	Elective –III (Discipline) Signal Processing and Smart Antennas for Wireless Communication		PG-WCC2-04-02	Elective-3 Signal Processing And Smart Antennas For Wireless Communication	If you Have Clear old PG- WCC2-04-02 Then don't appear PGWCC204T Otherwise Have to appear New PGWCC204T Elective –I (Discipline Specific)
PGWCC204/2T	Elective –III (Discipline) Satellite Communication		PG-WCC2-05-02	Elective-4 Satellite Communication	If you Have Clear old PG- WCC2-05-02 Then don't appear PGWCC204T Otherwise Have to appear New PGWCC204T Elective –I (Discipline Specific)
PGFD205T	Foundation Courses –I Research Methodology		-----	-----	Have to appear
PGWCC206P	Laboratory –III (NSC)		-----	-----	Have to appear
PGWCC207P	Laboratory –IV (ADSA)		-----	-----	Have to appear

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters

**III Semester**  
**M. E.**  
**in**  
**Wireless Communication & Computing**

**Table-1**

Subject Code (OLD)	Subject (OLD)		Subject Code (NEW)	Subject (NEW)	
PG-WCC3-01	Mobile Computing		-----	-----	
PG-WCC3-02	Ad Hoc Wireless Networks		-----	-----	
PG-WCC3-03	Seminar on Project Spade Work		PGWCC303P	Project Seminar	

**Table-2**

Subject Code (NEW)	Subject (NEW)		Subject Code (OLD)	Subject (OLD)	Remark
PGOPEN301T	Elective –IV (Open)		PGOPEN301/4T	Elective –IV (Open) Mobile Application Development	Have to appear
PGFD302T	Foundation Courses -II		PGOPEN301/2T	Elective –IV (Open) Wireless communication and Network	Have to appear
PGWCC303P	Project Seminar		PGWCC303P	Project Seminar	

**IV Semester**  
**M. E.**  
**in**  
**Wireless Communication & Computing**

Subject Code (OLD)	Subject (OLD)		Subject Code (NEW)	Subject (NEW)	
PG-WCC4-01	Thesis & Defense		PGWCC401P	Project	

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**M. Tech. Wireless Communication and Computing (WCC) - I Semester**

Course Code	Course	Teaching Scheme		
		Hours Per Week		Credits
PGWCC101T	Ad-hoc Wireless Network	L	P	
		4	-	

**Unit I**

Wireless WANS AND MANS: Cellular architecture, Wireless in local loops, Wireless ATM, IEEE 802.16. WIRELESS INTERNET: Wireless internet, mobile IP, TCP in wireless domain, WAP

**Unit II**

AD HOC wireless networks: Space Cellular and ad hoc wireless networks, Issues in Ad Hoc wireless networks, Issues in designing MAC protocol for Ad Hoc wireless networks, Design goals of MAC protocols for Ad Hoc wireless networks, Classification of MAC protocols, Contention –Based protocols with reservation and scheduling mechanism, MAC protocols that use directional antennas, Issues in Designing Space MAC Protocol for Ad-Hoc Wireless Networks, MAC Protocol that use directional Antennas.

**Unit III**

Routing protocols for Ad Hoc wireless networks: Designing issues, classification of routing protocols, table driven routing protocols, On demand routing protocol, Hybrid routing protocol, Hierarchical routing protocols. Multicast routing in Ad Hoc wireless networks: Operations and classification of multicast routing protocols, Tree based multicast routing protocol, Mesh based multicast routing protocol.

**Unit IV**

Transport layer security protocols for Ad Hoc wireless networks: Designing issues, classification of transport layer solutions, feedback based TCP, TCP bus, Ad Hoc TCP, Security in Ad hoc wireless networks, Issues and challenges in security provisioning, Key management, Secure routing in Ad hoc wireless networks. Quality of Service: Issues and challenges in providing QoS in Ad Hoc wireless networks, classification of QoS solutions.

**Unit V**

Energy management in Ad Hoc wireless networks: Need for energy management, classification of energy management, battery management schemes, transmission power management schemes, system power management schemes. Wireless sensor networks: Sensor network architecture, data dissemination, data gathering, MAC protocol sensor networks, Location discovery.

**Text book:**

1. Ad Hoc Wireless Networks: Architecture and Protocols, C. Siva Ram Murthy, B.S. Manoj, Pearson education

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC102T	TCP/IP AND INTERNET	L	P
		4	-
			4

**UNIT-I:-** The TCP/IP Architecture, The Internet Protocol: IP Packet, IP Addressing, Subnet Addressing, IP Routing, Classless Inter-Domain Routing (CIDR), Address Resolution, Reverse Address Resolution, Fragmentation and Reassembly, ICMP: Error and Control Messages. IPv6: header format, Network Addressing, Extension Headers

**UNIT-II:-** User Datagram Protocol transmission Control Protocol: TCP Reliable Stream Service,

TCP Operation, TCP Protocol, DHCP and Mobile IP: Dynamic Host Configuration Protocol, Mobile IP.

**UNIT-III:-** Internet Routing Protocols: Routing Information Protocol, Open Shortest' Path First,

Border Gateway Protocol .Multicast Routing: Reverse-Path Broadcasting, Internet Group Management Protocol (IGMP), Reverse-Path Multicasting, Distance-Vector Multicast Routing Protocol.

**UNIT-IV :- Security Protocols:** Security and Cryptographic Algorithms: Applications of Cryptography to Security, Key Distribution. Security Protocols: IPSec, Secure Sockets Layer and Transport Layer Security Cryptographic Algorithms: DES, RSA,

**UNIT-V :- Multimedia Information and Networking:** Introduction to Digital Audio, Audio compression, Streaming Audio, Internet Radio, Voice over IP, Introduction to video, Video compression, Video on demand The Real time transport Protocol: RTP Scenarios and terminology,

RTP Packet format, RTP Control Protocol(RTCP) Session control Protocols: Session initiation Protocol, H.323 Multimedia communication systems, Media Gateway Control Protocols.

### Books and References:

1. Communication networks, Leon-Gracia & Widjaja,2001, *TMH*
2. An Engineering approach to computer networking, S. Keshav, Addison Wesley, 2001
3. TCP/IP Illustrated Volume 1: The protocols, 1/e--, W. Richard Stevens,Pearson Education
4. TCP/IP Illustrated, Volume 2 : The Implementation, 1/e - © 1996, Gary R. Wright.
5. TCP/IP Illustrated, Volume 3 : TCP for Transactions, HTTP, NNTP, and the UNIX Domain Protocols, 1/e -- © 1999, W. Richard Stevens.
6. Internetworking with TCP/IP Vol. I: Principles, Protocols & Architecture, 4/e - © 2000, Douglas E. Comer.
7. Internetworking with TCP/IP Vol. II: ANSI C Version : Design, Implementation, and Internals, 3/e -- © 1999, Douglas E. Comer.
8. Internetworking with TCP/IP Vol. III: Client-Server Programming and Applications, 2/e -- © 1996, Douglas E. Comer.
- 9.Computer Networking with Internet Protocols and Technology, 1/e — © 2003 William Stallings.
10. Computer Networks, 4/e — © 2002, Andrew S. Tanenbaum,
- 11.Computer Networks and Internets, 2/e — © 1998, Douglas E. Comer
- 12 High-Speed Networks and Internets, 2/e - © 2002, William Stallings

13 TCP/IP PROTOCOL SUITE, FOROUZAN, BEHROUZ A., Me grew Hill

14. RFC's and Internet drafts available from IETF. Articles in various journals and conference Proceedings.

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC103T	DSP Processors and Architectures	L	P
		4	-
			4

### Unit I

#### Introduction to digital signal processing:

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

### Unit II

#### Computational Accuracy In Dsp Implementations :

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

### Unit III

#### Architectures For Programmable Dsp Devices :

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

### Unit IV

#### Execution Control And Pipelining :

Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

### Unit V

#### Programmable Digital Signal Processors :

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

#### TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

#### REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC104/1T	Elective –I (Discipline Specific) <b>Multimedia Communication</b>	<b>L</b>	<b>P</b>
		<b>4</b>	<b>-</b>
		<b>4</b>	

### Unit-I

**Introduction:** Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products Stages of Multimedia Projects Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

### Unit-II

Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

### Unit-III

Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

### Unit-IV

Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

### Unit-V

Images Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,Video:Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

### References:

1. Tay Vaughan, "Multimedia, Making IT Work", McGraw Hill.
2. Buford, "Multimedia Systems", Addison Wesley.
3. Mark Nelson, "Data Compression Hand Book", BPB.
4. Sleinreitz, "Multimedia System", Addison Wesley.

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC104/2T	Elective –I (Discipline Specific) <b>Object Oriented Systems</b>	<b>L</b>	<b>P</b>
		<b>4</b>	<b>-</b>
			<b>4</b>

### UNIT I

**Introduction:** The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

### UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages. Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

### UNIT III

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

### UNIT IV

Introduction to Java: History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs, Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

### UNIT V

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application. Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

#### References:

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Mark Priestley "Practical Object-Oriented Design with UML", TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houston, "Object Oriented Analysis and Design with Applications", Pearson Education
6. Pandey, Tiwari, " Object Oriented Programming with JAVA" , Acme Learning



**Elective –II (Open)**

## II Semester M. Tech. (WCC)

Course Code	Course	Teaching Scheme		
PGWCC201T	Advanced Data Structure and Algorithms	Hours Per Week		Credits
		L	P	
		4	-	4

### Course Objectives:

1. To introduce to the student abstract data types and trees data structures.
2. To introduce advanced data structures required to design efficient computer algorithms.
3. To develop the skills to design and implement efficient programming solutions to various problems using appropriate data structure algorithms.
4. To introduce advanced algorithms and algorithm design techniques.

### Course Outcomes:

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

1. Select an appropriate algorithm or data structure to solve a real problem.
2. Apply algorithm analysis techniques to evaluate the performance of an algorithm and to compare data structures.
3. Apply and implement learned algorithm design techniques and data structures to solve the problems efficiently.
4. Use the advanced techniques to design and implement efficient algorithms for solving computing problems.

### Unit I: Basics of Data structures & Algorithms

**Data structures:** Linear and non linear data structures, ADT Implementation and Applications. Linked list, Doubly linked list, Circular Linked list.

**Algorithms:** The Role of Algorithms in Computing, Growth of Functions, Performance analysis time complexity and space complexity, Asymptotic Notation, Recurrences, Complexity Analysis Examples.

### Unit II: Trees Data Structures

Trees- General Binary trees, Binary Search trees, Expression Search – AVL, Introduction to Red Black trees and Splay tree, B Trees Implementations, Tree Traversals, heaps.

### Unit III: Graph Algorithms

Basics of graphs and their representations, BFS, DFS, Topological sorting, Minimum spanning trees (Kruskal and Prim's algorithms, disjoint set and Fibonacci heap data structures). Shortest Paths (Dijkstra, Bellman-Ford, Floyd-Warshall).

### Unit IV: Advanced Algorithmic Design Techniques

Amortized analysis: Aggregate Analysis, Accounting Method, Dynamic Tables. Dynamic Programming: Elements of Dynamic Programming, Matrix Chain Multiplication, Longest Common subsequences, Greedy Algorithms: An Activity Selection Problem, Elements of Greedy Strategy, Huffman codes.

### Unit V: NP-Completeness & Advanced Algorithms.

NP-Completeness, Polynomial time, Polynomial time Verification, NP-completeness & Reducibility, Flow networks, Randomized algorithms, Approximation Algorithms: set-covering Problem, Subset-Sum Problem.

### Text Book:

1. Introduction to Algorithms, Tomas H. Cormen, Aharles E. Leiserson, Ronald L Rivest, Slifford Stein, PHI

### Reference Books:

1. Aho Hopcroft Ullman, "Data Structures and Algorithms", Pearson Education
2. Algorithmics, One Spirit of Computing, David Harel, Pearson Education
3. Introduction to the design and analysis of Algorithms, S E Goodman, S T He

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC202T	Network Security and Cryptography	L	P
		4	-
		Credits	
		4	

**UNIT I:**

**Overview:** Services, Mechanisms and attacks, OS1 security architecture, Model for network security.

**UNIT II:**

**Classical Encryption Techniques:** Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography, Problems. **Block Ciphers and DES (Data Encryption Standards):** Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems.

**UNIT III:**

**Public Key Cryptography and RSA:** Principles of public key cryptosystems, RSA algorithm, Problems.

**Other Public Key Crypto Systems and Key Management:** Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Problems.

**UNIT IV:**

**Digital Signature and Authentication Protocol:** Digital signature, Authentication protocols, Digital signature standard.

**Authentication Applications:** Kerberos, X.509 authentication service, Kerberos encryption technique, Problems. **Message Authentication and Hash Functions:** Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of Hash functions and MAC's, Problems

**UNIT V:**

**Electronic Mail Security:** Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator.

**IP Security:** Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Security associations, Key management, Problems.) **Firewalls:** Firewall design principles; trusted systems, Problems.

**Wireless Security Issues:**The Unique Security Environment of Wireless, "Notable Security Failures With WiFi and GSM, Authentication, Authorization and Accounting, IEEE 802.11 (WiFi) Solutions; Initial and Revised Virtual Private Networks.

**Text Books:**

1. William Stallings, "Cryptography and Network Security," 3<sup>rd</sup> edition, Pearson Education (Asia) Pte. Ltd./ Prentice Hall of India, 2003.
2. C. Kaufman, R. Perlman, and M. Speciner, "Network Security: Private Communication in a Public World," 2<sup>nd</sup> edition, Pearson Education (Asia) Pte. Ltd., 2002. Kahate, "Cryptography and Network Security," Tata McGraw-Hill, 2003.

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC203T	Advance Digital Image Processing	L	P
		4	-
		Credits	
		4	

Unit-I

**Digital Image Fundamentals:** Simple image model, Fundamentals Steps in Image Processing, Elements of visual perception, image sensing and acquisition, Image Sampling and Quantization, Basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations, Introduction to 2D Fourier Transform and Liner Algebra. Fundamental operations of image processing using image processing tool.

Unit II

**Intensity Transformations and Filtering:** Spatial intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing filters, sharpening filters, fuzzy techniques for intensity transformations and spatial filtering. Frequency domain filtering- sampling and Fourier transform of sampled functions, Discrete Fourier transform, properties of DFT, smoothing and sharpening in frequency domain.

Unit III

**Color Image Processing and Wavelets:** Color models, intensity slicing, color transformations, fundamentals of wavelets- image pyramids, subband coding, Harr transform, multi-resolution expansion- series scaling and wavelet functions, 1D wavelet transform-wavelet series expansion, discrete wavelet transform, continuous wavelet transform, fast wavelet transform, 2D wavelet transform, wavelet packets .

Unit-IV

**Image Compression and Morphological Processing:** Image Compression fundamentals- coding redundancy, spatial and temporal redundancy, image compression models, image formats and compression standards, compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW, Run Length coding, wavelet coding, digital image watermarking, morphological operations- dilation, erosion, duality, opening, closing, hit/miss transformation, boundary extraction, hole filling, extraction of connected components, thinning, thickening, skeletons, pruning.

Unit V

**Image Segmentation and Object Recognition:** fundamentals, detection of isolated point, line and edge detection, edge linking and boundary detection, global thresholding basics, multiple thresholds, variable thresholding, multivariable thresholding, region growing, region splitting and merging, morphological watersheds- dam construction, watershed segmentation algorithm, markers, segmentation using motion- spatial techniques, frequency domain techniques. Patterns and patterns classes, matching, optimal statistical classifier, neural network, matching shape numbers, string matching.

**Recommended Books :**

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, 2nd edition, Pearson Education.
2. A. K. Jain, “Fundamental of Digital Image Processing”, PHI.
3. William Pratt, “Digital Image Processing”, 4<sup>th</sup> Edition, Wiley India Edition.

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC204/1T	Signal Processing and Smart Antennas for Wireless Communication	L	P
		4	-
			4

**UNIT I:-**

**Overview of wireless and mobile:** Cellular system concepts, standards and Evolution of mobile & wireless communication technologies.

**UNIT II:-**

**Wireless channel characterization:** Attenuation, Shadowing, Fading, Doppler Shift, Delay Spread, Co-channel, Adjacent Channel and other forms of interferences. Modulation techniques: QAM, Multitone, MSK, OMSK, CPM, TFM and OFDM.

**UNIT III:-**

**Receiver architecture and algorithms:** Digital IF receivers, Sub-sampling digital receivers, I & Q channel sampling, Noncoherent and Coherent techniques, Rake receiver. Equalization and Synchronization: MLSE, Adaptive Equalization: LMS, RLS & Blind adjustment, Timing recovery and carrier

**UNIT IV:-**

**Smart Antennas systems:** Generalized array signal processing, Beam forming concepts: DOB, TRB & SSBF, Switched beam antennas, spatial diversity, and fully adaptive antennas for enhanced coverage, range extension & improvement in frequency reuse, interference Nulling for LOS & Multipath systems.

**UNIT V:-**

SDMA concepts and Smart antennas implementation issues.**RF ICs:** LNA, IQ Modulator, Mixers, DSPs & Micro-controllers in wireless communications, ASICs and FPGAs.

**Texts/ References:**

- 1.T.S. Rappaport, *Wireless Communication: Principles & Practices*, 2/e, 2002, Prentice Hall.
- 2.J. Liberti & T.S. Rappaport, *Smart Antennas for Wireless Communication: IS-95 and Third Generation CDMA applications*, 1999, Prentice Hall.
3. B. Pattan, *Robust Modulation Methods and Smart Antennas in Wireless communications*, 2000, Prentice Hall.

Course Code	Course	Teaching Scheme	
		Hours Per Week	Credits
PGWCC204/2T	Satellite Communication	L	P
		4	-
		4	

**UNIT I:**

**Introduction:** Origin and brief history of satellite communications, an overview of satellite system engineering, satellite frequency bands for communication.

**Orbital theory:** Orbital mechanics look angle determinations, numerical examples, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication system performance, Azimuth & elevation calculations

**Spacecraft systems:** Attitude and orbit control system(AOCS), telemetry, tracking,command (TT&C) and monitoring, power systems, communications subsystems,transponders, spacecraft antennas, Equipment reliability and space qualification.

**UNIT II:**

Satellite link design: Basic transmission theory, noise figure and noise temperature , and G/T ratio, Satellite down link design, Satellite systems using small earth stationsatellite uplink design, design for specified C/N ratio, Combining C/N and C/I values in Satellite links, System design examples.

**UNIT III:**

**Modulation, Multiplexing, Multiple access Techniques:**

Analog telephone transmission, Fm theory, FM Detector theory, analog TV transmission, S/N ratio Calculation for satellite TV linking, Digital transmission, base band and band pass transmission of digital data, BPSK, QPSK , FDM, TDM, Access techniques: FDMA, TDMA, CDMA and Random access.

**UNIT IV:**

**Encoding & FEC for Digital satellite links:** Channel capacity, error detection coding, linear block, binary cyclic codes, and convolution codes, Implementation of error detection on satellite links.

**UNIT V:**

**Propagation on satellites** - earth paths and its influence on link design: propagation effects, rain and ice effects, elimination of the above effects.

**Earth station technology** -Design of large antennas, equipments for earth stations video receiver, frequency coordination, , VSAT technology, Direct Broadcast by satellite (DBS), Intelsat and Inmarsat.

**Text Books:**

1. Timothy Pratt, Charles W. Bostian, "Satellite communication:, John Wiley &sons, f 1986
2. Dennis Roddy, "Satellite Communication", TMH, 3ed, 2001
3. Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson, "**Satellite Communication Systems Engineering**," Prentice Hall, January 1993,

**References:**

1. Tom Logs Don, "Mobile communication satellites: theory and applications", McGraw Hill, 1995
2. J.J. Spilker, Digital Communication by satellite, PH Publication, 1997
3. J. Martin, Communication satellite systems, PH, 4<sup>th</sup> Edition, 2005





**Elective –IV (Open)**

**Foundation Course –II**

Course Code	Course	Teaching Scheme		
PGFD302T	<b>Project planning and Management</b>	Hours Per Week		Credits
		L	P	
		4	-	4