

**Course Name: Communication Networks**

**Course Code: EC-601**

**Course Type: PC**

**(Semester – VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Digital System Design  
Analog Communication  
Digital Communication

**2. Course Learning Objectives:**

- i. This course Build an understanding of the fundamental concepts of computer networking.
- ii. An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
- iii. An understanding of specific implemented protocols covering the application
- iv. layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack
- v. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System –**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** COMMUNICATION NETWORKS

**Course Code:** EC-601

**Hours per Week:** 3L: 0T:2P

**Credits:** 3

Module	Topics	32L
1.	<b>Introduction:</b> Overview of the Internet: Evolution of Computer Networks, Components of Computer Networks, application of Computer Networks, Network criteria, Direction of data flow (simplex, half duplex, full duplex), Network Components, Topologies, Protocol: TCP/IP Protocol Suite, Network Models: OSI Model & TCP/IP Protocol stack.	6L
2.	<b>Physical Layer:</b> Overview of data, signal, transmission & transmission media, Review of data transmission principles, Transmission components, Different line coding techniques, Digital carrier modulation techniques: ASK, PSK, QPSK,Data compression techniques: TDM, FDM, WDM, switching: Circuit switching, Message Switching and packet switching.	6L
3.	<b>Data link Layer:</b> Types of errors, Error Detection & Correction Methods, Flow control, Protocols: stop & wait ARQ, go-back-NARQ selective repeat ARQ, token bus, token ring, reservation, polling.Multiple access protocols: Pure ALOHA, slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA,Traditional	6L

Module	Topics	32L
	Ethernet, Fast Ethernet	
4.	<b>Network Layer:</b> Internetworking & devices: repeaters, hubs, bridges, switches, router and gateway. Addressing: Internet address, classful address, and subnetting. Routing: techniques, static vs. dynamic routing, and routing table for classful address. Protocols: ARP, RARP, IP, ICMP, IPV6, unicast and multicast routing protocols.	6L
5.	<b>Transport Layer:</b> Introduction: Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.	5L
6.	<b>Application Layer:</b> Principle of application layer protocols: WWW and HTTP, FTP, Telnet, SMTP, DNS etc. Network security threats, Cryptography. Security in the Internet: IP Security & Firewalls.	3L

## 5. References:

### Text Books:

- Data Communications and Networking, Behrouz A Forouzan, 4/e, Tata McGraw Hill Education Private Limited.
- Computer Networks, Andrew. S. Tanenbaum, 4/e, Prentice Hall of India Private Ltd, 2003.
- Data Communications & Networks, Achyut S. Godbole, Tata McGraw Hill Education Private Limited, 2002.
- Data and Computer Communication, William Stalling, 7/e, Prentice Hall of India Private Ltd, 2007.

### Reference Books:

- Computer Networking: A top-down approach featuring the Internet, Kurose and Rose, Pearson Education
- Communication Networks, Leon and Garica, TMH
- Communication Networks, Walrand, TMH

## 6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-601.1	Understand the fundamentals of computer networks, architectures, protocols, and reference models (OSI & TCP/IP).	Explain	Understand
EC-601.2	Explain data transmission techniques, media, coding, modulation, compression, and switching methods.	Describe	Understand
EC-601.3	Apply error control, flow control, multiple access, and Ethernet protocols in data communication.	Explain	Understand
EC-601.4	To understand internetworking concepts including devices, IP addressing, subnetting, routing, and core protocols for efficient data	Implement	Understand

	communication.		
<b>EC-601.5</b>	To Illustrate transport layer principles, services, and protocols such as TCP and UDP.	Implement	Understand
<b>EC-601.6</b>	To Analyze application layer protocols, security threats, cryptography, and Internet security mechanisms.	Analyze	Analyze

**7. Mapping of Course Outcomes (CO) to module / course content:**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	2	-	-	-
3	-	2	3	-	-	-
4	-	-	-	3	2	-
5	-	-	-	2	3	2
6	-	-	-	-		3

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	2	1	1	1	1	-	-	-	-	-	1
<b>CO2</b>	2	3	1	1	1	1	-	-	-	-	-	1
<b>CO3</b>	1	2	3	1	1	1	-	-	-	-	-	1
<b>CO4</b>	1	1	2	3	1	1	-	-	-	-	-	1
<b>CO5</b>	1	1	1	2	3	1	-	-	-	-	-	1
<b>CO6</b>	1	1	1	1	2	3	-	-	-	-	-	1

**9. Mapping to Program Specific Outcome(PSO):**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-
<b>CO2</b>	3	2	-
<b>CO3</b>	3	3	2
<b>CO4</b>	3	2	2
<b>CO5</b>	2	3	1
<b>CO6</b>	-	2	1

**\*\*\* End of Syllabus\*\*\***

**Course Name: Control System**  
**Course Code: EC-602**  
**Course Type: PC**  
**(Semester – VI)**  
**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Laplace Transforms  
 Complex Analysis  
 Differential Equation  
 Matrix  
 Signal and System

**2. Course Learning Objectives:**

- i. This course introduces the concepts about system stability and their applications.
- ii. Students will also learn to design and analyze basic system design.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System** –

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** CONTROL SYSTEM

**Course Code:** EC-602

**Hours per Week:** 3L: 0T: 0P

**Credits:** 3

Module	Topics	36L
1	<b>Introduction:</b> Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.	9L
2	<b>Time Response Analysis:</b> Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems-Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.	6L
3	<b>Stability Analysis in S-Domain:</b> The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability	3L
4	<b>Root Locus Technique:</b> The root locus concept - construction of root loci-effects of adding poles and zeros to $G(s)$ $H(s)$ on the root loci	3L
5	<b>Frequency Response Analysis:</b> Introduction, Frequency domain specifications-Bode diagrams- Determination of Frequency domain specifications and Phase margin and Gain margin- Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots Stability Analysis. Compensation	9L

	techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.	
6	<b>State Space Analysis of Continuous Systems:</b> Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties–Concepts Controllability and Observability.	6L

#### 5. References:

##### Text Books:

- Control Systems Theory and Applications - S. K. Bhattacharya, Pearson, 3rd Edition, 2013.
- B.C. Kuo, Automatic Control Systems, 9th Edition, Prentice Hall of India, 9th Edition, 2014.
- I.J. Nagarath and M. Gopal: Control Systems Engineering, 6th Edition, New Age Pub.Co. 2018.
- Control Systems - N. C. Jagan, BS Publications, 3rd Edition, 2015.
- Control Systems - A. AnanadKumar, PHI, 2nd Edition, 2014.
- Control Systems Engineering - S. Palani, TMH, 3rd Edition, 2016.

##### Reference Books:

- K. Ogata, —Modern Control Engineering||, Prentice Hall, 5th Edition 2009
- Control Systems - Dhanesh N. Manik, Cengage Learning.
- Control Systems - N. K. Sinha, New Age International (P) Limited Publishers, 4th Edition, 2013

#### 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC602.1	Understand the basic objectives of control system design	Explain	Understand
EC602.2	Derive input-output relationship of systems based on their mathematical modeling governed by basic laws of physics	illustrate	Analyze
EC602.3	Justify stability of systems based on their transfer functions, time domain and frequency domain specifications	Justify	Evaluate
EC602.4	Develop concepts on root pattern with variable gains and comment on the stability	Determined	Apply
EC602.5	Determine the stability of closed-loop system based on open loop frequency response.	Determined	Evaluate
EC602.6	Design controllers so as to meet design specifications both in time as well as frequency domain.	Design	Analyze

**7. Mapping of Course Outcomes (CO) to module / course content:**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	3		-	-	-	-
3	-	-	3	-	-	-
4	-	-	3	3		-
5	-	-	-	-	3	2
6	1	2				

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	2	-	-	-	2	-	1
CO2	3	2	2	2	-	2	-	-	-	2	-	1
CO3	1	3	3	2	-	2	-	-	-	2	-	1
CO4	1	3	3	1	-	2	-	-	-	2	-	1
CO5	2	3	2	1	-	2	-	-	-	2	-	1
CO6	1	2	3	1	2	2	-	-	-	2	-	1

**9. Mapping to Program Specific Outcome(PSO):**

COs	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	3	2	1
CO5	3	2	1
CO6	3	2	1

**\*\*\* End of Syllabus\*\*\***

**Course Name: Database Management Systems**

**Course Type: ES**

**Course Code: EC-603**

**Semester – VI**

**Course Broad Category: (Ability Enhancement)**

---

**1. Course Prerequisite:**

Data Structures and Algorithms Strong understanding of data structures and algorithms is crucial DBMS relies on principles of efficient data organization and retrieval Operating Systems Knowledge of operating system Concepts are beneficial for understanding memory management file systems Concurrency control mechanisms used in DBMS Basic Programming Skills Proficiency in a programming language is necessary to understand Implement database concepts

**2. Course Learning Objectives:**

- i. To understand the different issues involved in the design and implementation of a database system.
- ii. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- iii. To understand and use data manipulation language to query, update, and manage a database.
- iv. To develop an understanding of essential DBMS concepts such as: database security,
- v. Integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- vi. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- vii. To understand the different issues involved in the design and implementation of a database system.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology-** This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System:**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** DATABASE MANAGEMENT SYSTEMS

**Course Code:** EC-603

**Hours per Week:** 3L: 0T: 0P

**Credits:** 3

Module	Topics	36L
1	<b>Database System Architecture:</b> Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations	9L
2	<b>Relational Query Languages:</b> Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Loss less design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	13L
3	<b>Storage strategies:</b> Indices, B-trees, hashing	3L
4	<b>Transaction processing:</b> Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multiversion and optimistic Concurrency Control schemes, Database recovery.	5L
5	<b>Database Security:</b> Authentication, Authorization and access control, DAC, MAC and RBAC models, ntrusion detection, SQL injection.	3L
6	<b>Advanced topics:</b> Object oriented and object relational databases, Logical Databases, Web databases, Distributed Databases, Data warehousing and data Mining.	3L

## 5. References:

### Text Books:

- "Database System Concepts" , 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.

### Reference books:

- Database Management Systems, R.P. Mahapatra, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
- "Fundamentals of Database Systems" , 5th Edition by R. Elmasri and S. Navathe,

- Pearson Education “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

**6. Course Outcomes (CO):**

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC603.1	For a given query write relational algebra expressions for that query and Optimize the developed expressions.	Explain	Understand
EC603.2	For a given specification of the requirement design the databases using E R method and normalization	solve	Apply
EC603.3	For a given specification construct the SQL queries for Open source and commercial DBMS -MYSQL, ORACLE, and DB2.	Simplify	Analyze
EC603.4	For a given query optimize its execution using Query optimization algorithms	Determined	Apply
EC603.5	For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability	Determined	Evaluate
EC603.6	Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling	Design	Analyze

**7. Mapping of Course Outcomes (CO) to module / course content:**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	-

5	-	-	-	2	-	3
---	---	---	---	---	---	---

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	-	-	-	-	-	-	2
CO2	3	3	1	2	2	-	-	-	-	-	-	2
CO3	3	3	1	2	2	-	-	-	-	-	-	2
CO4	3	3	1	2	2	-	-	-	-	-	-	2
CO5	3	3	1	2	2	-	-	-	-	-	-	2
CO6	3	3	1	2	2	-	-	-	-	-	-	2

**9. Mapping to Program Specific Outcome (PSO):**

COs	PSO1	PSO2	PSO3
CO1	2	3	-
CO2	2	3	-
CO3	2	3	-
CO4	2	3	-
CO5	2	3	-
CO6	2	3	-

**\*\*\* End of Syllabus\*\*\***

**Course Name: Nano Electronics**

**Course Code: EC-604**

**Course Type: PE**

**(Semester – VI)**

**Course Broad Category: (MAJOR)**

**1. Course Prerequisite:**

Analog electronics,  
Electronics devices  
Mathematics  
Quantum physics

**2. Course Learning Objectives:**

- i. This course introduces the concepts about nanotechnology, nanodevices and their applications.
- ii. Students will also learn to design and analyze nanostructure components.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System –**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** NANO ELECTRONICS

**Course Code:** EC-604

**Hours per Week:** 3L: 0T:0P

**Credits:** 3

Module	Topics	36L
1.	Introduction to nanotechnology, mesostructures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.	12L
2.	Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).	10L
3.	Resonant Tunneling Diode, Single electron transistors, Carbon nano tube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation	14L

**5. References:**

**Text Books:**

- G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
- W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Material and Novel Devices), Wiley-VCH, 2003.

### Reference Books:

- K.E. Drexler, Nano systems, Wiley, 1992.
- J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
- C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

### 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC- 604.1	Explain the Device physics for Nano Electronics	Explain	Understand
EC- 604.2	Understand various aspects of Nano Device Technology	Comprehension, Analysis	Analyze
EC- 604.3	Understand the concept of Shrink Down Approach	Apply, Understand, Evaluate	Evaluate
EC- 604.4	Apply the concept of limit of scaling to design Nano components.	Design	Apply
EC- 604.5	Explain the various Application of Nano Electronics Devices	Implement	Apply
EC- 604.6	Select Appropriate Nano Device to solve practical problem	Design	Analyze

### 7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	2		1	-
2	3	2	1		-	2
3	3		3	2	2	2

### 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	3	3	2	2							
CO5	3	2										
CO6	3	3	3	2	2							

### 9. Mapping to Program Specific Outcome(PSO)

COs	PSO1	PSO2	PSO3
CO1	3		
CO2	3		
CO3	2		
CO4	3		
CO5	3		
CO6	3		

\*\*\* End of Syllabus\*\*\*

**Course Name: Low-Power VLSI Design**

**Course Code: EC- 605**

**Course Type: PE**

**(Semester – VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Concept of Basic Electronics Engineering  
Digital Electronics  
Semiconductor Devices  
Digital System Design  
CMOS VLSI Design

**2. Course Learning Objectives:**

- i. This course acquaint students on power dissipation mechanisms in VLSI circuits,
- ii. Students will also learn estimation, modeling, and optimization techniques to apply across device, circuit, logic, architectural, and system levels design strategies for power reduction.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System –**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** Low-Power VLSI Design

**Course Code:** EC-604

**Hours per Week:** 3L: 0T: 0P

**Credits:** 3

Module	Topics	36L
1	<b>Introduction:</b> Need and importance of low-power design, Sources of Power-dissipation in CMOS: Dynamic- Switching and Short-circuit, Static-Sub threshold leakage, Gate oxide leakage and Junction leakage, Technology scaling and its impact on power, Average power, peak power, Power-Delay-Product, power estimation, Threshold voltage engineering, Thermal effects on power	10L
2	<b>Low-Power Design at Circuit Level:</b> Transistor sizing for low power, Voltage scaling (VDD scaling), Dynamic voltage and frequency scaling (DVFS), Clock gating and power gating, Leakage current minimization techniques: Multi-threshold CMOS (MTCMOS), Sleep transistors, body biasing, Dual-Vt techniques, Adiabatic logic and energy recovery circuits, Sub-threshold design	10L
3	<b>Low-Power Design at Logic and Architecture Level:</b> Switching activity reduction, Logic restructuring and retiming, Delay element sharing and elimination, Glitch avoidance, path balancing, Asynchronous vs. synchronous design in power-sensitive applications, Dynamic logic vs. static logic, Pipelining and parallelism for low power, Energy harvesting	10L

Module	Topics	36L
	systems	
4	<b>Low-Power Design at System Level:</b> ASIC vs FPGA considerations, Power management in SoC, Multi-VDD design, On-chip power distribution, Low-power clock distribution networks	6L

## 5. References:

### Text Book:

- N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective, 4th Edition, Pearson Education India, 2011.
- Kaushik Roy and Sharat C. Prasad, Low Power CMOS VLSI Circuit Design, Wiley,

### Reference Books:

- Introduction to VLSI Circuits and Systems, John P. Uyemura, John Wiley & Sons
- Modern VLSI Design: System-on-Chip Design, Wayne Wolf, PHI
- CMOS Digital Integrated Circuits – S. Mo. Kang and Yusuf Leblebici, 3rd Ed, TMH
- Chip Design for submicron VLSI: CMOS Layout and Simulation, John P. Uyemura, Thomson India Edition.

## 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-605.1	Understand and Explain the sources of power dissipation and the impact of technology scaling on power consumption in CMOS circuits	Explain	Understand
EC-605.2	Analyze dynamic and static power components and estimate power dissipation for given VLSI circuits.	Analyze, Estimate	Evaluate
EC-605.3	Apply and select circuit-level low-power techniques to reduce energy consumption.	Select	Apply
EC-605.4	Design low-power digital circuits at logic levels	Design	Create
EC-605.5	Apply and select architecture-level low-power techniques to reduce energy consumption.	Select	Apply
EC-605.6	Understand and Explain system level low-power technique	Explain	Understand

## 7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	3	-	-	-	-
2	-	-	3	-	-	-
3	-	-	-	3	3	-
4	-	-	-	-	-	3

### 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	1	-	-	1	-	1
CO2	3	2	-	1	-	-	1	-	-	1	-	1
CO3	3	2	-	1	-	-	1	-	-	1	-	1
CO4	3	2	-	1	-	-	1	-	-	1	-	1
CO5	3	2	-	1	-	-	1	-	-	1	-	1
CO6	3	2	-	1	-	-	1	-	-	1	-	1

### 9. Mapping to Program Specific Outcome (PSO)

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-
CO6	3	-	-

\*\*\* End of Syllabus\*\*\*

**Course Name: Power Electronics**

**Course Type: PE**

**Course Code: EC-606**

**(Semester – VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Electric Circuit Theory  
Analog Electronics  
Electromagnetic field theory  
Digital Electronics

**2. Course Learning Objectives:**

- i. To understand the functioning and characteristics of power switching devices.
- ii. To understand the principle of operation of converters.
- iii. To understand different triggering circuits and techniques of commutation of SCR
- iv. To find external performance parameter of converters
- v. To analyze methods of voltage control, improvement of power factor and reduction of harmonics of the converter
- vi. To solve numerical problems of converters

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology-** This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System –**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** POWER ELECTRONICS

**Course Code:** EC-606

**Hours per Week:** 3L: 0T: 0P

**Credits:** 3

Module	Topics	40L
1	<b>Introduction:</b> Concept of power electronics, application of power electronics, uncontrolled converters, advantages and disadvantages of power electronics converters, power electronics systems, power diodes, power transistors, power MOSFETS, IGBT and GTO	4L

Module	Topics	40L
2	<b>PNPN devices:</b> Thyristors, brief description of members of Thyristor family with symbol, V-I characteristics and applications. Two transistor model of SCR, SCR turn on methods, switching characteristics, gate characteristics, ratings, SCR protection, series and parallel operation, gate triggering circuits, different commutation techniques of SCR.	5L
3	<b>Phase controlled converters:</b> Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and RLE loads, effects of freewheeling diodes and source inductance on the performance of converters. External performance parameters of converters, techniques of power factor improvement, single phase and three phase dual converters	6L
4	<b>DC-DC converters:</b> Principle of operation, control strategies, step up choppers, types of choppers circuits based on quadrant of operation, performance parameters, multiphase choppers	5L
5	<b>Inverters:</b> Definition, classification of inverters based on nature of input source, wave shape of output voltage, method of commutation & Connections. Principle of operation of single phase and three phase bridge inverter with R and R-L loads, performance parameters of inverters, methods of voltage control and harmonic reduction of inverters.	10L
6	<b>Resonant Pulse Converters:</b> Introduction, Series Resonant inverter, Parallel Resonant inverter, Zero-Current Switching Resonant converters, Zero-Voltage Switching Resonant converter, Two quadrant Zero-Voltage Switching Resonant converter, Resonant DC link inverter.	5L
7	<b>Applications:</b> Speed control of AC and DC motors. HVDC transmission. Static circuit breaker, UPS, static VAR controller	5L

## 5. References:

### Text Books:

- Power Electronics, M.H. Rashid, 4th Edition, Pearson
- Power Electronics, P.S. Bimbhra, Khanna Publishing House.
- Power Electronics, V.R. Moorthi, Oxford.
- Power Electronics, M.D. Singh and K.B. Khanchandani, Tata McGraw Hill

### Reference Books:

- Modern Power Electronics & AC drives, B.K. Bose, Prentice Hall
- Power Electronics, Mohan, Undeland & Riobbins, Wiley India
- Element of power Electronics, Phillip T Krein, Oxford.
- Power Electronics systems, J.P. Agarwal, Pearson Education.
- Analysis of Thyristor power conditioned motor, S.K. Pillai, University Press.
- Power Electronics, M.S. Jamal Asgha, PHI.
- Power Electronics : Principles and applications, J.M. Jacob, Thomson

## 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC606.1	Differentiate between signal level and power level devices.	Explain	Understand
EC606.2	Construct triggering and commutation circuits of SCR	solve	Apply
EC606.3	Explain the principle of operation of AC-DC, DC-DC and DC-AC converters.	Simplify	Analyze
EC606.4	Analyze the performance of AC-DC, DC-DC and DC-AC converters	Evaluate	Apply
EC606.5	Apply methods of voltage control and harmonic reduction to inverters	Determined	Apply
EC606.6	Solve numerical problems of switching devices, AC-DC, DC-DC and DC-AC converters.	Examine	Analyze

## 7. Mapping of Course Outcomes (CO) to module / course content:

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	3	3	-	-
5	2	-	-	-	3	2
6	1	2		2	2	

## 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):

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

<b>CO3</b>	3	3	1	2	2	-	-	-	-	-	-	2
<b>CO4</b>	3	3	1	2	2	-	-	-	-	-	-	2
<b>CO5</b>	3	3	1	2	2	-	-	-	-	-	-	2
<b>CO6</b>	3	3	1	2	2	-	-	-	-	-	-	2

**9. Mapping to Program Specific Outcome (PSO):**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	2	3	-
<b>CO2</b>	2	3	-
<b>CO3</b>	2	3	-
<b>CO4</b>	2	3	-
<b>CO5</b>	2	3	-
<b>CO6</b>	2	3	-

**\*\*\* End of Syllabus\*\*\***

**Course Name: Information Theory and Coding**

**Course Code: EC-607**

**Course Type: PE**

**(Semester- VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Requires a foundational understanding of probability Statistics  
Principles of signals and systems  
Continuous-time  
Discrete-time signal analysis  
System properties  
Convolution  
Fourier techniques

**2. Course Learning Objectives:**

- i) To develop a clear understanding of the concept of information within communication theory and highlight its importance in designing efficient communication receivers.
- ii) To provide an in-depth study of channel capacity calculations required for error-free data transmission, along with detailed coverage of widely used source coding and channel coding techniques.
- iii) To enable students to design coding schemes for data compression and error correction, while offering a comprehensive perspective on how these techniques influence the development of an optimal communication receiver.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions.

**Evaluation System** –

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** INFORMATION THEORY AND CODING

**Course Code:** EC- 607

**Hours per Week:** 3L: 0T:0P

**Credits:** 3

Module	Topic	36L
1	<b>Introduction to Probability:</b> Random Variables, Random variable, Sample space, Conditional probability, Joint probability; Mathematical model for information source- Self Information; Mutual Information; Discrete Entropy; Definition and properties; Joint and conditional entropies; Entropy in the continuous case; Kraft inequality; Exercise Problems.	9L
2	<b>Discrete memory less channel:</b> Binary symmetric channel, Binary Erasure channel, Classification of channels & channel capacity; Calculation of channel capacity; Shannon Fano algorithm; Huffman algorithm; Exercise Problems.	10L
3	<b>Error Correction Codes:</b> Introduction to Galois fields, polynomial arithmetic; linear block codes for error correction – Generator matrix, Encoding, Parity Check matrix, Standard array decoding and Syndrome decoding; Cyclic Codes – Generation of codes, encoding and syndrome calculation; Exercise Problems.	11L
4	<b>Convolution encoder:</b> Code tree, state diagram, trellis diagram, Viterbi algorithm, MATLAB based problem solving.	6L

## 5. References:

### Text Books:

- N. Abramson, Information and Coding, McGraw Hill, 1963
- M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987

### Reference books:

- R.B. Ash, Information Theory, Prentice Hall, 1970
- Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983

## 6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-607.1	Explanation of the concept of dependent and independent sources, along with the measurement of information, entropy, rate of information.	Explain, Measure	Understand, Evaluate
EC-607.2	Derive equations for entropy, mutual information and channel capacity for all kinds of channels.	Derive	Analyze
EC-607.3	Implement the various types of source coding algorithms and analyze their performance.	Implement	Apply Analyze
EC-607.4	Design linear block codes and cyclic codes	Design	Evaluate Create
EC-607.5	Implement and decode a sequence at the receiver using Trellis decoder and Viterbi decoder.	Implement	Analyze, Apply
EC-607.6	Perform mathematical analysis of problems in Information Theory and Coding, Implementation and verification using MATLAB simulation	Implement	Analyze evaluate

## 7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	-
2	-	3	-	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	-
5	-	-	-	2	-	3

## 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	-	-	-	2	-	1
CO2	3	1	1	1	-	-	-	-	-	2	-	1
CO3	3	1	1	1	-	-	-	-	-	2	-	1
CO4	3	1	1	1	-	-	-	-	-	2	-	1
CO5	3	1	1	1	-	-	-	-	-	2	-	1
CO6	2	1	1	1	-	-	-	-	-	2	-	1

**9. Mapping to Program Specific Outcome (PSO)**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	-	-
<b>CO2</b>	3	-	-
<b>CO3</b>	3	-	-
<b>CO4</b>	3	-	-
<b>CO5</b>	3	-	-
<b>CO6</b>	3	-	-

**\*\*\* End of Syllabus\*\*\***

**Course Name: Fundamentals of Cryptography**

**Course Code: EC-608**

**Course Type: PC  
(Semester – VI)**

**Course Broad Category: Multidisciplinary**

**1. Course Prerequisite:** Mathematics, Basic Programming, Basic Algebra, Information Security Basics, Boolean logic and digital circuits

**2. Course Learning Objectives:**

- To introduce students to the core concepts of classical and modern cryptography.
- To develop an understanding of symmetric and asymmetric encryption schemes.
- To expose students to cryptographic algorithms and their mathematical foundations.
- To analyze cryptographic protocols and hash functions for data integrity and authentication.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology–** Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System –**

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** FUNDAMENTALS OF CRYPTOGRAPHY

**Course Code:** EC- 608

**Hours per Week:** 3L:0T:0P

**Credits:** 3

Module	Topics	32L
1.	<b>Introduction to Cryptography:</b> Cryptography: Terminology, Goals (Confidentiality, Integrity, Authentication, Non-repudiation) Types of Attacks: Ciphertext-only, Known-plaintext, Chosen-plaintext, Chosen-ciphertext, Classical Cryptography: Caesar Cipher, Monoalphabetic and Polyalphabetic Ciphers, Playfair Cipher, Hill Cipher, Vigenère Cipher, Transposition Techniques, Introduction to Cryptanalysis and Frequency Analysis, Limitations of Classical Cryptography	8L
2.	<b>Symmetric Key Cryptography:</b> Symmetric Cryptography Overview: Stream vs. Block Ciphers, Data Encryption Standard (DES): Algorithm Structure, Key Generation, Feistel Network, Advanced Encryption Standard (AES): SubBytes, ShiftRows, MixColumns, AddRoundKey, Modes of Operation: ECB, CBC, CFB, OFB, CTR, Overview of RC4, Blowfish, and IDEA Algorithms,	8L

Module	Topics	32L
	Security Analysis: Key size, Brute-force attack, Known attack scenarios	
3.	<b>Asymmetric Key Cryptography and Digital Signatures:</b> Need for Public Key Cryptography, RSA Algorithm: Key Generation, Encryption/Decryption, Security, Diffie–Hellman Key Exchange Protocol, ElGamal Encryption (Overview), Elliptic Curve Cryptography (ECC): Introduction, Benefits, Applications, Digital Signatures: RSA and DSA, Public Key Infrastructure (PKI) and Certificate Authorities (CA)	8L
4.	<b>Hash Functions, Authentication Protocols, and Applications:</b> Cryptographic Hash Functions: Properties (Pre-image Resistance, Collision Resistance), MD5, SHA-1, SHA-2, SHA-3, HMAC and MAC: Concepts and Applications, Authentication Protocols: Needham-Schroeder, Kerberos, Cryptographic Protocols: SSL/TLS, IPsec, HTTPS, Applications in Secure Email, Digital Certificates, Digital Currency, Introduction to Blockchain: Hashing, Digital Signature in Blockchain.	8L

## 6. References:

### Text books:

- William Stallings, Cryptography and Network Security: Principles and Practice, Pearson
- Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill
- Douglas R. Stinson, Cryptography: Theory and Practice, CRC Press.

### Reference books

- Bruce Schneier, Applied Cryptography, Wiley
- Trappe and Washington, Introduction to Cryptography with Coding Theory, Pearson
- NIST Standards and RFCs on Cryptographic Algorithms and Protocols.
- 

## 7. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-608.1	Understand the principles, goals, and types of cryptographic systems.	Explain	Understand
EC-608.2	Analyze and implement classical cryptographic techniques like substitution and transposition ciphers.	Identify	Analyze
EC-608.3	Apply symmetric key cryptography algorithms such as DES and AES.	Identify	Analyze
EC-608.4	Explain and implement public key cryptography techniques like RSA, ECC, and Diffie-Hellman	Identify, Design	Apply
EC-608.5	Describe cryptographic hash functions and authentication mechanisms.	Design	Apply

<b>EC-608.6</b>	Evaluate and compare cryptographic protocols used in secure communication and emerging technologies.	Implement	Understand
-----------------	--	-----------	------------

**8. Mapping of Course Outcomes (CO) to module / course content**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	-
2	-	3	-	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	-
5	-	-	-	2	-	3

**9. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1	1	1	-	-	-	-	-	2	-	1
<b>CO2</b>	3	1	1	1	-	-	-	-	-	2	-	1
<b>CO3</b>	3	1	1	1	-	-	-	-	-	2	-	1
<b>CO4</b>	3	1	1	1	-	-	-	-	-	2	-	1
<b>CO5</b>	3	1	1	1	-	-	-	-	-	2	-	1
<b>CO6</b>	2	1	1	1	-	-	-	-	-	2	-	1

**10. Mapping to Program Specific Outcome(PSO)**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-
<b>CO2</b>	3	-	-
<b>CO3</b>	3	-	-
<b>CO4</b>	3	-	-
<b>CO5</b>	3	-	-
<b>CO6</b>	3	-	-

**\*\*\* End of Syllabus\*\*\***

**Course Name: Applications of Artificial Intelligence  
In Electronics and Communications**

**Course Code: EC- 609**

**Course Type: OE  
(Semester VI)**

**Course Broad Category: (Multi Disciplinary)**

**1. Course Prerequisite:**

Basic signal processing concepts  
Analog and Digital signals  
Fourier methods  
Sampling and modulation fundamentals  
A foundational understanding of probability  
Random variables and statistical measures  
Familiarity with communication systems  
Channel behavior  
Embedded systems  
AI-driven ECE applications

**2. Course Learning Objectives:**

- i. To introduce the role of AI in modern signal processing and communication systems within ECE.
- ii. To provide familiarity with data preprocessing, feature extraction, and evaluation metrics relevant to ECE signal datasets.
- iii. To develop skills in applying machine learning algorithms for modulation recognition, channel estimation, and spectrum sensing.
- iv. To enable students to design deep learning models for advanced applications such as channel prediction, signal denoising, and radar signal generation.
- v. To explore specialized AI applications in wireless, radar, speech, biomedical, and embedded real-time signal processing.
- vi. To engage students with emerging AI trends in digital communication, including 6G, edge AI, and intelligent resource allocation.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** – Lectures and Presentations, Interactive Discussions.

**Evaluation System** –

- A. Continuous Internal Assessment I - (40 marks)
- B. Continuous Internal Assessment II - (40 marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN ELECTRONICS AND COMMUNICATIONS

**Course Code:** EC-609

**Hours per Week:** 3L: 0T:0P

**Credits:** 3

Module	Topic	36L
1	<b>Introduction to course scope:</b> AI relevance in signal processing and communication systems; fundamentals of analog/digital signals, transforms, filters, and modulation; pattern recognition for ECE signals; overview of AI/ML in communications; data preprocessing and feature extraction methods; performance metrics such as BER, SNR, classification accuracy; tools such as MATLAB, NumPy, SciPy, scikit-learn; case studies including adaptive beam forming and interference cancellation.	9

2	<b>Linear regression for channel estimation:</b> KNN, SVM, Decision Trees for modulation recognition; clustering (K-Means, hierarchical) for spectrum sensing; PCA/LDA for dimensionality reduction; cross-validation, confusion matrices, ROC; over fitting and regularization (Lasso, Ridge); practical ML on communication datasets.	9
3	<b>Neural networks for equalization and nonlinear system modeling:</b> CNNs for IQ-based modulation classification; RNNs/LSTMs for channel prediction; auto encoders for denoising and compression; GANs for synthetic radar signal generation; transfer learning for PCB defect analysis; practical deep learning sessions on RF/ECG datasets.	9
4	<b>AI-enhanced channel coding/decoding:</b> AI-driven AMC; AI-based channel equalization; intelligent resource allocation; traffic prediction; edge AI deployments; ethical and security considerations; future directions including 6G and IoT communications; course review and project presentations.	6
5	<b>AI in wireless communication for dynamic spectrum access:</b> AI in Massive MIMO for beam forming; radar target detection; speech enhancement using deep learning; AI in image processing for thermal/optical sensors; biomedical AI for ECG/EEG analysis; embedded edge AI for real-time signal processing; ethical implications in ECE systems; AI in quantum/terahertz communication; project presentations and research reviews.	3

## 5. References:

### Text Books:

- Max A. Little – Machine Learning for Signal Processing

### Reference Books:

- Dong Yu & Li Deng – Deep Learning for Signals and Systems
- Yong Liang Guan – Deep Learning for Wireless Communications
- Papoulis & Pillai, Probability, Random Variables & Stochastic Processes

## 6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-609.1	Understand AI, ML, and DL concepts applied to signal processing and communication systems	Explain	Understand
EC-609.2	Apply ML algorithms for RF, biomedical, and network signal analysis	Implement	Apply
EC-609.3	Design deep learning architectures for modulation classification, channel estimation, and signal prediction	Design	Apply/Analyze
EC-609.4	Evaluate systems using BER, SNR, and classification metrics appropriate to ECE	Evaluate	Evaluate
EC-609.5	Develop AI applications in wireless, radar, speech, and biomedical processing	Implement	Analyze
EC-609.6	Address ethical and real-world deployment considerations in AI-enabled ECE systems	Interpret	Analyze

## 7. Mapping of Course Outcomes (CO) to module / course content:

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	3	2	-	-	-
2	-	3	2	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	2
5	-	-	-	-	3	3

**8. Mapping of the Course outcomes to Program Outcomes:**

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	2	-	1
CO2	3	2	1	1	-	-	-	-	-	2	-	1
CO3	3	1	2	1	-	-	-	-	-	2	-	1
CO4	3	2	2	1	-	-	-	-	-	2	-	1
CO5	3	1	2	1	-	-	-	-	-	2	-	1
CO6	2	1	1	1	-	-	-	-	-			

**9. Mapping to PSO:**

COs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	2	-
CO3	3	2	-
CO4	3	3	-
CO5	3	3	-
CO6	3	3	-

**\*\*\* End of Syllabus\*\*\***

**Course Name: Cyber Law & Intellectual Property Rights**

**Course Code: EC – 610**

**Course Type: OE**

**(Semester – VI)**

**Course Broad Category: (Multi Disciplinary)**

**1. Course Prerequisite:**

Laplace Transforms Complex Analysis

Differential Equation Matrix

Signal & System

**2. Course Learning Objectives:**

i. This course introduces the concepts about system stability and their applications

ii. Students will also learn to design and analyze basic system design

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology-**This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System –**

A. Continuous Internal Assessment I - (40 marks)

B. Continuous Internal Assessment II - (40 marks)

C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** Cyber Law & Intellectual Property Rights

**Course Code:** EC-610

**Hours per Week:** 3L: 0T: 0P

**Credits:** 3

Module	Topics	22L
1	<b>Cyber World</b> : An Overview, The internet and online resources ,Security of information, Digital signature An Overview Cyber Law: Introduction about the cyber space , Regulation of cyber space – introducing cyber law Scope of Cyber laws – ecommerce; online contracts; IPRs (copyright, trademarks and software patenting); e-taxation; e-governance and cyber crimes, Cyber law in India with special reference to Information Technology (Amendment) Act, 2008	9L

Module	Topics	22L
2	<b>IPR:</b> Introduction : Origin and Genesis of IPR , Theories of IPR – Locke’s, Hegel and Marxian Ethical, moral and human rights perspectives of IPR, Intellectual Property Rights: International Relevance, Internationalization of IP protection – Paris Convention, Berne Convention, TRIPS Agreement –basic principles and minimum standards – limits of one-size-fit for all flexibilities under TRIPS	6L
3	<b>Intellectual Property:</b> Issues and Challenges: Geographical Indications, Layout designs of Integrated Circuits and Protection of Plant Varieties and Farmers' Rights. Copyright protection with reference to performers rights and Artist rights, Global governance towards Patents , Trade Marks: Legal recognition, Comparative analysis in India, EU and USA, Trade secrets : Legal recognition, Comparative analysis in India, EU and USA	3L
4	<b>Intellectual Property:</b> Contemporary Trends Benefit sharing and contractual agreements – International Treaty on Plant Genetic Resources for Food and Agriculture – issues on patent policy and farmers’ rights- CBD, Nagoya Protocol and Indian law, UNESCO – protection of folklore/cultural expressions Developments in WIPO on traditional knowledge and traditional cultural expressions	4L

## 5. References:

### Text Books:

- Duggal Pavan, Cyber Law - An exhaustive section wise Commentary on The Information Technology Act along with Rules, Regulations, Policies, Notifications etc. UNIVERSAL LAW PUBLISHING CO. PVT. LTD. C-FF-1A, Dilkhush Industrial Estate, (Near Azad Pur Metro Station) G. T. Karnal Road, Delhi -110033, INDIA2014

### Reference Books:

- Intellectual Property Rights in India : General Issues and Implications Prankrishna Pal
- Jonathan Rosenoer, “Cyberlaw: the Law of the Internet”, Springer-verlag, 1997.
- W. Cornish & Llewelyn – Intellectual Property: Patent, Copyrights, Trade Marks & Allied Rights”, London Sweet & Maxwell.
- Nard Madison- The Intellectual Property, Aspian Publication.
- Carlosm Correa- Oxford commentaries on GATT/ WTO Agreements trade Related aspects of Intellectual Property Rights, Oxford University Press.
- Cornish William – Intellectual Property. Cambridge University Press.

**6. Course Outcomes (CO):**

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC610.1	Understand the role of intellectual property rights	Explain	Understand
EC610.2	Identify the main types of intellectual property rights	solve	Apply
EC610.3	Understand the steps for successful registration and protection of intellectual property rights at national, regional and international levels	Simplify	Analyze
EC610.4	Search patent and trademark databases	Determined	Apply
EC610.5	Understand the legal aspects for intellectual property protection	Determined	Apply
EC610.6	Technical understanding: Develop a basic understanding of the technical aspects of cyber law and the jurisdiction issues related to it.	Understand	Analyze

**7. Mapping of Course Outcomes (CO) to module / course content:**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	3	-	-	-
4	-	-	3	3	-	-
5	-	-	-	-	3	2
6	1	2	-	-	-	-

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	2	-	-	-	2	-	1
CO2	3	2	2	2	-	2	-	-	-	2	-	1
CO3	1	3	3	2	-	2	-	-	-	2	-	1
CO4	1	3	3	1	-	2	-	-	-	2	-	1
CO5	2	3	2	1	-	2	-	-	-	2	-	1
CO6	1	2	3	1	2	2	-	-	-	2	-	1

**9. Mapping to Program Specific Outcome (PSO):**

COs	PSO1	PSO2	PSO3
CO1	2	3	1
CO2	2	3	1
CO3	2	3	-
CO4	2	3	1
CO5	2	3	-
CO6	2	3	1

**\*\*\* End of Syllabus\*\*\***

**Course Name: Electronic Measurement & Measuring Instruments**

**Course Code: EC -611**

**Course Type: OE**

**(Semester –VI)**

**Course Broad Category: (Multi Disciplinary)**

**1. Course Prerequisite:**

Typically include Basic Electrical Engineering  
Basic, Digital and Analog Electronics.

**2. Course Learning Objectives:**

- i. Describe the fundamental concepts and principles of instrumentation Classes, Inheritance.
- ii. Explain the operation of various instruments required in measurements..
- iii. Apply the measurement techniques for different types of tests .
- iv. To select specific instruments for specific measurement function.
- v. Understand principle of operation and working of different electronic instruments  
Students will understand functioning, specification and application of signal analyzing instruments.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology**– Lectures and Presentations, Interactive Discussions and Case Studies.

**Evaluation System –**

- A. Continuous Internal Assessment I (40 Marks)
- B. Continuous Internal Assessment II (40 Marks)
- C. End-Semester Exam (60 Marks)

**4. Course Content:**

**Course Name:** Electronic Measurement & Measuring Instruments

**Course Code:** EC-611

**Hours per Week:** 3L: 0T:0P

**Credits:** 3

Module	Topics	42L
1.	Block Schematics of Measuring Systems: Performance characteristics, Static characteristics, Accuracy, Precision ,Resolution, Types of Errors, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.	10L
2.	Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Capacitance-Voltage Meters, Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator.	10L
3.	Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency. Special Purpose Oscilloscopes :Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CRO.	10L

Module	Topics	42L
4.	Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Piezoelectric Transducers, MagnetoStrictive Transducers.	6L
5.	Bridges:Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge. Measurement of Physical Parameters:Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Pressure ,High Pressure, Vacuum level, Temperature Measurements, Data Acquisition Systems.	6L

#### 5. References:

##### Text Book:

- Electronic instrumentation: H.S.Kalsi, TMH, 2nd Edition 2004.

##### Reference Book:

- Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W.D. Cooper: PHI, 5th Edition, 2003

#### 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-611.1	Explain the basic concepts of measurement, standards, errors, accuracy, precision, and calibration procedures in electronic measurement systems.	Understand	Apply
EC-611.2	Analyze the operation and characteristics of analog and digital measuring instruments such as voltmeters, ammeters, multimeters, wattmeters, and energy meters.	Identify	Analyze
EC-611.3	Apply AC and DC bridge circuits (Wheatstone, Maxwell, Wien, Schering, Kelvin, etc.) for measurement of resistance, inductance, capacitance, and unknown parameters.	Analyze	Analyzing
EC-611.4	Interpret the working principles, specifications, and applications of CRO, DSO, and other electronic display instruments to measure electrical waveforms and system parameters.	Analyze	Analyzing
EC-611.5	Examine the working of signal generators, function generators, frequency counters, and spectrum analyzers used in testing and calibration.	Identify	Understanding
EC-611.6	Demonstrate the application of various transducers (LVDT, strain gauge,	Explain	Understanding

	thermocouples, RTD, capacitive, inductive, optical) for measurement of physical quantities and interface them with measuring systems.		
--	---	--	--

**7. Mapping of Course Outcomes (CO) to module / course content:**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	1	–	–	–	–
2	1	3	1	–	–	–
3	–	1	3	–	–	–
4	–	–	1	3	1	–
5	–	–	–	1	3	1
6	–	–	–	–	1	3

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	–	–	–	–	–	–	1	–	1
CO2	3	3	2	1	–	–	–	–	–	1	–	1
CO3	2	3	3	1	–	–	–	–	–	1	–	1
CO4	2	2	3	3	2	–	–	–	–	2	–	1
CO5	2	2	3	3	3	–	–	–	–	2	–	1
CO6	2	1	2	3	3	–	–	–	2	3	1	2

**9. Mapping to Program Specific Outcome (PSO):**

COs	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	3	2
CO3	2	2	3
CO4	2	3	2
CO5	2	3	3
CO6	3	3	3

**\*\*\* End of Syllabus\*\*\***

**Course Name: Communication Networks Laboratory**

**Course Code: EC-691**

**Course Type: PC  
(Semester – VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Operating Systems Laboratory  
Communication Engineering Laboratory

**2. Course Learning Objectives:**

- i. Students will learn to apply networking principles through the set-up, configuration, and testing of actual network switches, routers, and other networking and computing equipment.
- ii. Students will complete weekly labs that require them to implement a specific network configuration.
- iii. Students will get familiar with switching and routing protocols through intensive lab work and projects.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology: Instruction:** This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System –**

A. **Internal Assessment (60 Marks)**- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. **End-Semester Exam (40 Marks)**- Summative Assessment.

**4. Course Content:**

**Course Name:** COMMUNICATION NETWORKS LAB

**Course Code:** EC-691

**Hours per Week:** 0L: 0T: 2P

**Credits:** 1

Module	Topics	
1	<ol style="list-style-type: none"> <li>I. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.</li> <li>II. Understanding the basic networking commands and their operation in Windows and Linux.</li> </ol>	3P
2.	<ol style="list-style-type: none"> <li>I. Understanding the hardware used for networking like routers, switches, LAN cables, connectors, fiber, access points, network interface cards, zigbee cards, Bluetooth cards, broadband modems, etc.</li> <li>II. Study of network IP and connect the computers in Local Area Network.</li> <li>III. Configure different Network topologies using packet tracer software and study their characteristics.</li> </ol>	4P
3.	<ol style="list-style-type: none"> <li>I. Network Socket programming: TCP/UDP Client-Server program.</li> </ol>	2P

Module	Topics	
4.	I. Simulation of Data Link layer protocols in MATLAB. a) Stop and wait, b) Go-back-N, c) Selective repeat and d) Sliding window II. Simulation of ARP/RARP III. Applications using TCP and UDP Sockets like DNS and SNMP	4P
5.	I. Simulation of wired network using Network Simulator	2P

**5. References:**

**Text Books:**

- WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

**Reference Books:**

- Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition

**6. Course Outcomes (CO):**

After going through this course, the students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC-691.1	Identify different types of network cables and implement cross-wired and straight-through cables using a clamping tool, while understanding basic networking commands and their operation in Windows and Linux.	Implement	Apply
EC-691.2	Understand networking hardware, study network IP and LAN connectivity, and configure various network topologies using Packet Tracer to analyze their characteristics	Understand	Apply
EC-691.3	Develop and implement TCP/UDP client-server programs using network socket programming	Implement	Create
EC-691.4	Simulate Data Link layer protocols in MATLAB, implement ARP/RARP	Implement	Apply
EC-691.5	Develop TCP/UDP socket-based applications like DNS and SNMP	Develop	Create
EC-691.6	Simulate and analyze wired networks using Network Simulator	Analyze	Apply

**7. Mapping of Course Outcomes (CO) to module / course content**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	3	-
5	-	-	-	-	-	3

### 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	2	-	-	-	-	-	-	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2
CO3	2	2	3	2	3	-	-	-	-	-	-	2
CO4	2	3	2	3	2	-	-	-	-	-	-	2
CO5	2	2	3	2	3	-	-	-	-	-	-	2
CO6	2	2	2	3	3	-	-	-	-	-	-	2

### 9. Mapping to Program Specific Outcome (PSO)

COs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	2	3	-
CO3	2	2	-
CO4	2	3	-
CO5	2	3	-
CO6	2	2	-

\*\*\* End of Syllabus\*\*\*

**Course Name: Control System Laboratory**

**Course Code: EC-692**

**Course Type: PC**

**(Semester – VI)**

**Course Broad Category: (Major)**

**1. Course Prerequisite:**

Signal and systems  
Linear algebra  
Laplace transforms

**2. Course Learning Objectives:**

- i. Expose students to write MATLAB Code on Control System.
- ii. To gain practical knowledge by applying experimental methods to correlate with Control System theory.
- iii. To apply the analytical techniques and graphical analysis to the experimental data.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology: Instruction:** This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System –**

- A. **Internal Assessment (60 Marks)**- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]
- B. **End-Semester Exam (40 Marks)**-Summative Assessment.

**4. Course Content:**

**Course Name:** CONTROL SYSTEM LAB

**Course Code:** EC-692

**Hours per Week:** OL: OT: 3P

**Credits:** 1

Module	Topics	
1.	<b>Introduction:</b> 1.Familiar to Control Engineering MATLAB Commands 2.Block Diagram Reduction and Pole-Zero plot	2P
2.	<b>Time Response Analysis:</b> 1.Dynamic response of a plant model with different inputs 2.Determination of Step & Impulse Response for First and Second Order Unity Feedback System 3.Determination of Damping Effect on the Standard Second Order System 4.Study the Transient Performance Specifications of Standard Second Order System 5.Determination of Impulse and Step Response for a Type '0' Type '1' and Type '2' Systems	5P
3.	<b>Root Locus Technique:</b> Determination of Root Locus plot using MATLAB control system toolbox	1P
4.	<b>Frequency Response Analysis:</b> Determination of Bode plot using MATLAB control system toolbox, Determination of Nyquist using MATLAB control system toolbox	2P
5.	<b>PID Controller Design:</b> Design the system using MATLAB SIMULINK.	1P
6.	<b>State Space Analysis of Continuous Systems:</b> Check the controllability and observability of the system using MATLAB	1P

## 5. References:

### Text Books:

- K.Ogata, "Modern Control Engineering", Prentice Hall, 5<sup>th</sup> Edition, 2010.
- J.Nagrath, M.Gopal, "Control System Engineering", New Age International, 6<sup>th</sup> Edition, 2018.

### Reference Books:

- N.S.Nise, "Control System Engineering", WileyIndia, 7<sup>th</sup> Edition, 2015.
- R.C.Dorf, R.H.Bishop, "Modern Control Systems", Pearson, 13<sup>th</sup> Edition, 2017.

## 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC 692.1	Acquire knowledge about the control systems commands.	Acquire	Understand
EC 692.2	Obtain the mathematical models of dynamic systems in transfer function and state-space forms.	Identify, Select	Examine
EC 692.3	Analyze and define the LTI system performance and stability in both time-domain and frequency domain	Analyze	Apply
EC 692.4	Compute the Root locus and design the appropriate compensate or using Root locus technique.	Implement	Apply
EC 692.5	Compute Bode, Nyquist plots and design the Appropriate compensate or using Bode plot technique.	Implement	examine
EC 692.6	Compute System Design using MATLAB SIMULINK	Implement	Analyze

## 7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	2		1	-
2	3	2	1		-	2
3	3		3	2	2	2

## 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	2	2	2	0	0	2	0	2
CO2	1	3	3	2	2	1	1	1	0	1	0	2
CO3	2	3	3	3	2	2	1	1	2	1	1	2
CO4	2	2	3	2	2	2	2	1	2	2	1	2
CO5	2	2	3	2	2	2	2	1	2	2	1	2
CO6	2	3	2	1	3	2	0	0	0	1	2	2

### 9. Mapping to Program Specific Outcome (PSO)

COs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	3	2	2
CO3	3	2	3
CO4	2	3	3
CO5	3	3	3
CO6	1	3	2

**\*\*\* End of Syllabus\*\*\***

**Course Name: Database Management System Laboratory**

**Course Code: EC- 693**

**Course Category: ES**

**(Semester – VI)**

**Course Broad Category: (Skill Enhancement)**

---

**1. Course Prerequisite:**

Data Structures and Algorithms, Basic programming knowledge, Proficiency in a programming language is needed to connect the database to a front-end application

**2. Course Learning Objectives:**

- i. SQL and DML/DDL: Implement Data Manipulation Language (DML) and Data Definition Language (DDL) constructs using SQL to create, alter, and manipulate database tables.
- ii. Advanced SQL queries: Learn to write queries using various clauses like ORDER BY, GROUP BY, HAVING, and JOIN to fetch data based on specific conditions.
- iii. Procedural language: Gain proficiency in PL/SQL to write stored procedures, functions, and programs that extend the capabilities of SQL.
- iv. Database objects: Understand and create other database objects, including VIEWS, INDEXes, TRIGGERS, and CURSORS.
- v. Correlated queries: Learn to write and execute correlated queries to retrieve data based on complex conditions.
- vi. Arithmetic and relational operators: Utilize a variety of arithmetic and relational operators within SQL statements.
- vii. Database design and implementation: Apply the principles of relational database design to build practical applications.

**3. Teaching methodology and evaluation system for the course:**

**Teaching methodology** -This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

**Evaluation System –**

- A. **Internal Assessment (60 Marks)**- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]
- B. **End-Semester Exam (40 Marks)** - Summative Assessment.

#### 4. Course Content:

**Course Name:** DATABASE MANAGEMENT SYSTEM LAB

**Course Code:** EC -693

**Hours per Week:** OL: OT: 4P

**Credits:** 2

Module	Topics	
1	<b>Creating a Database:</b> Creating a Table, Specifying Relational Data Types, Specifying Constraints, Creating Indexes	3P
2	<b>Table and Record Handling:</b> INSERT statement Using SELECT and INSERT together DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements	3P
3	<b>Retrieving Data from a Database:</b> The SELECT statement Using the WHERE clause Using Logical Operators in the WHERE clause Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause Using Aggregate Functions Combining Tables Using JOINS Sub queries	3P
4	Database Management Creating Views Creating Column Aliases Creating Database Users Using GRANT and REVOKE	3P

#### 5. References:

##### Text Books:

- “Database System Concepts” , 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.

##### Reference Books:

- Database Management Systems, R.P. Mahapatra, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
- Fundamentals of Database Systems” , 5th Edition by R. Elmasri and
- Navathe, 5.PearsonEducation “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

## 6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC693.1	Implement SQL: Effectively implement fundamental and advanced SQL commands for data manipulation and retrieval..	Acquire	Understand
EC693.2	Design and Implement: Design and implement a simple database system by applying concepts like ER modeling and normalization	Identify	Apply
EC693.3	Develop Stored Procedures: Create stored procedures and functions to implement complex business logic.	Simplify	Analyze
EC693.4	Handle Exceptions: Use triggers, cursors, and exception handling to build robust and reliable database applications.	Analyze	Apply
EC693.5	Develop Applications: Connect a database to a front-end tool to develop practical, GUI-based applications.	Implement	Apply
EC693.6	Apply Database Concepts: Apply learned concepts to a real-life case study, showcasing skills in data management and application development Implement	Examine	Analyze

## 7. Mapping of Course Outcomes (CO) to module / course content:

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	-
5	-	-	-	2	-	3

**8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	-	-	-	-	-	-	2
CO2	3	3	1	2	2	-	-	-	-	-	-	2
CO3	3	3	1	2	2	-	-	-	-	-	-	2
CO4	3	3	1	2	2	-	-	-	-	-	-	2
CO5	3	3	1	2	2	-	-	-	-	-	-	2
CO6	3	3	1	2	2	-	-	-	-	-	-	2

**9. Mapping to Program Specific Outcome (PSO):**

COs	PSO1	PSO2	PSO3
CO1	2	3	-
CO2	2	3	-
CO3	2	3	-
CO4	2	3	-
CO5	2	3	-
CO6	2	3	-

**\*\*\* End of Syllabus\*\*\***

### 8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	2	2	2	0	0	2	0	2
CO2	1	3	3	2	2	1	1	1	0	1	0	2
CO3	2	3	3	3	2	2	1	1	2	1	1	2
CO4	2	2	3	2	2	2	2	1	2	2	1	2
CO5	2	2	3	2	2	2	2	1	2	2	1	2
CO6	2	3	2	1	3	2	0	0	0	1	2	2

### 9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	3	2	2
CO3	3	2	3
CO4	2	3	3
CO5	3	3	3
CO6	1	3	2

\*\*\* End of Syllabus\*\*\*