

**SRINIVAS UNIVERSITY**  
**COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**Electronics and Communication Engineering**

**Scheme and the Subjects of Ph.D. Course Work**

Sl.No	Subject Code	Subject Title	Credits	Marks
1	18PHDRM	Research Methodology	4	100
2	20SPHDEC01	Advanced Embedded System	4	100
3	20SPHDEC02	Automotive Electronics	4	100
4	20SPHDEC03	Cryptography And Network Security	4	100
Total				400

**Scheme of Examination**

Continuous Internal Assessment: 50 Marks (30 + 20 = 50)	1. Department level presentations (2): 15 + 15 = <b>30</b> , 2. Assignments (1): <b>20</b> .
End Semester Examination: 50 Marks (5 x 10 = 50)	One question from each module with internal choice. Each question carries 10 marks.

# ADVANCED EMBEDDED SYSTEM

## 20SPHDEC01

### Module -1

**Embedded System:** Embedded vs General computing system, classification, application and purpose of ES. Core of an Embedded System, Memory, Sensors, Actuators, LED, Optocoupler, Communication Interface, Reset circuits, RTC, WDT, Characteristics and Quality Attributes of Embedded Systems (Selected Topics from Ch -1, 2, 3 of Text 1).

### Module -2

Hardware Software Co-Design, embedded firmware design approaches, computational models, embedded firmware development languages, Integration and testing of Embedded Hardware and firmware, Components in embedded system development environment (IDE), Files generated during compilation, simulators, emulators and debugging (Selected Topics From Ch-7, 9, 12, 13 of Text 1).

### Module -3

**ARM-32 bit Microcontroller:** Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence (Ch 1, 2, 3 of Text 2).

### Module -4

**Instruction Sets:** Assembly basics, Instruction list and description, useful instructions, Memory Systems, Memory maps, Cortex M3 implementation overview, pipeline and bus interface (Ch-4, 5, 6 of Text 2).

### Module -5

Exceptions, Nested Vector interrupt controller design, SysTick Timer, Cortex-M3 Programming using assembly and C language, CMSIS (Ch-7, 8, 10 of Text 2).

**Text Books:** 1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009.

2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd edn, Newnes, (Elsevier), 2010.

### Reference Book:

1. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008

# Automotive Electronics

## 20SPHDEC02

**Module -1** Automotive Fundamentals, the Systems Approach to Control and Instrumentation:

Use Of Electronics In The Automobile, Antilock Brake Systems, (ABS), Electronic steering control, Power steering, Traction control, Electronically controlled suspension. (Chap.1 and 2 of Text)

**Module -2** The basics of Electronic Engine control: Integrated body: Climate controls, Motivation for Electronic Engine Control, Concept of An Electronic Engine Control System, Definition of General Terms, Definition of Engine Performance Terms, Electronic fuel control system, Engine control sequence, Electronic Ignition(Chap. 5 of Text)

**Module -3** Sensors and Actuators, Applications of sensors and actuators, air flow rate sensor, Indirect measurement of mass air flow, Engine crankshaft angular position sensor, Automotive engine control actuators, Digital engine control, Engine speed sensor ,Timing sensor for ignition and fuel delivery, Electronic ignition control systems, Safety systems, Interior safety, Lighting, Entertainment systems.(Chap.6 of Text).

**Module -4** Vehicle Motion Control and Automotive diagnostics: Cruise control system, Digital cruise control, Timing light, Engine analyzer, On-board and off-board diagnostics, Expert systems. Stepper motor based actuator, Cruise control electronics, Vacuum – antilock braking system, Electronic suspension system Electronic steering control, Computerbased instrumentation system, Sampling and Input\output signal conversion, Fuel quantity measurement, Coolant temperature measurement, Oil pressure measurement, Vehicle speed measurement, Display devices, Trip-Information-

Computer, Occupant protection systems. (Chap. 8 and 10 of Text)

**Module -5** Future automotive electronic systems: Alternative Fuel Engines, Collision Wide Range Air/Fuel Sensor, Alternative Engine, Low Tire Pressure Warning System, Collision avoidance Radar Warning Systems, Low Tire Pressure Warning System, Radio Navigation, Advance Driver information System. Alternative-Fuel Engines, Transmission Control , Collision Avoidance Radar Warning System, Low Tire Pressure Warning System, Speech Synthesis Multiplexing in Automobiles, Control Signal Multiplexing, Navigation Sensors, Radio Navigation, Sign post Navigation , Dead Reckoning Navigation Future Technology, Voice Recognition Cell Phone DialingAutomatic Driving Control. (Chap. 11 of Text)

### **Text Book:**

1. William B. Ribbens, "Understanding Automotive Electronics", SAMS/Elsevier publishing, 6th Edition, 1997.

### **Reference Book:**

1. Robert Bosch GmbH,"Automotive Electrics and Automotive Electronics- Systems and Components, Networking and

Hybrid Drive", Springer Vieweg, 5th Edition, 2007.

# **CRYPTOGRAPHY AND NETWORK SECURITY**

## **20SPHDEC03**

**Module -1** Foundations: Terminology, Steganography, substitution ciphers and transpositions ciphers, Simple XOR, One-Time Pads, Computer Algorithms (Text 2: Chapter 1: Section 1.1 to 1.6) SYMMETRIC CIPHERS: Traditional Block Cipher structure, Data encryption standard (DES), The AES Cipher. (Text 1: Chapter 2: Section 2.1, 2.2, Chapter 4)

**Module -2** Introduction to modular arithmetic, Prime Numbers, Fermat's and Euler's theorem, primality testing, Chinese Remainder theorem, discrete logarithm. (Text 1: Chapter 7: Section 1, 2, 3, 4, 5) Principles of Public-Key Cryptosystems, The RSA algorithm, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography

(Text 1: Chapter 8, Chapter 9: Section 9.1, 9.3, 9.4)

**Module -3** Pseudo-Random-Sequence Generators and Stream Ciphers: Linear Congruential Generators, Linear Feedback Shift Registers, Design and analysis of stream ciphers, Stream ciphers using LFSRs, A5, Hughes XPD/KPD, Nanoteq, Rambutan, Additive generators, Gifford, Algorithm M, PKZIP

(Text 2: Chapter 16)

**Module -4** One-Way Hash Functions: Background, Snefru, N-Hash, MD4, MD5, Secure Hash Algorithm [SHA], One way hash functions using symmetric block algorithms, Using public key algorithms, Choosing a one-way hash functions, Message Authentication Codes. Digital Signature Algorithm, Discrete Logarithm Signature Scheme

(Text 2: Chapter 18: Section 18.1 to 18.5, 18.7, 18.11 to 18.14 and Chapter 20: Section 20.1, 20.4)

**Module -5** E-mail Security: Pretty Good Privacy-S/MIME (Text 1: Chapter 17: Section 17.1, 17.2). IP Security: IP Security Overview, IP Security Policy, Encapsulation Security Payload (ESP), Combining security Associations. (Text 1: Chapter 18: Section 18.1 to 18.4). Web Security: Web Security Considerations, SSL

(Text 1: Chapter 15: Section 15.1, 15.2).

### **Text Books:**

1. William Stallings , "Cryptography and Network Security Principles and Practice", Pearson Education Inc., 6th Edition, 2014, ISBN: 978-93-325-1877-3
2. Bruce Schneier, "Applied Cryptography Protocols, Algorithms, and Source code in C", Wiley Publications, 2nd Edition, ISBN: 9971-51-348-X

### **Reference Books:**

1. Cryptography and Network Security, Behrouz A. Forouzan, TMH, 2007.
2. Cryptography and Network Security, AtulKahate, TMH, 2003.