
	<b>THE NATIONAL COLLEGE</b> <b>BASAVANGUDI, BANGALORE-560004</b> <b>[AUTONOMOUS]</b> <b>DEPARTMENT OF ELECTRONICS</b>	
	<b>EMBEDDED SYSTEMS</b>	
	<b>Duration: 30 Hours</b>	<b>Course code: EC-ES</b>
	<b>Course Description:</b>  <p>The Embedded Systems course provides students with a comprehensive understanding of the design, development, and implementation of embedded systems. Through a combination of theoretical lectures, hands-on laboratory sessions, and practical projects, students will learn about the architecture, programming, interfacing, and real-time operating systems (RTOS) used in embedded systems. Emphasis will be placed on practical skills development and the application of embedded systems in various industries such as automotive, consumer electronics, healthcare, and industrial automation.</p> <p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>1. Understand the fundamentals of embedded systems, including hardware and software components.</li> <li>2. Gain proficiency in programming microcontrollers and microprocessors for embedded applications.</li> <li>3. Learn about real-time operating systems (RTOS) and their role in embedded systems.</li> <li>4. Explore interfacing techniques for sensors, actuators, and communication modules.</li> <li>5. Develop skills in designing and debugging embedded systems projects.</li> <li>6. Apply embedded systems concepts to real-world applications and projects.</li> </ol>	
<b>Module 1:</b>		<b>7 Hours</b>
<p>Introduction to Embedded Systems</p> <ul style="list-style-type: none"> <li>• Definition and characteristics of embedded systems</li> <li>• Overview of hardware and software components</li> <li>• Applications of embedded systems in various industries</li> </ul> <p>Microcontroller Architecture and Programming</p> <ul style="list-style-type: none"> <li>• Introduction to microcontrollers and microprocessors</li> <li>• Architecture of popular microcontroller families (e.g., ARM, AVR, PIC)</li> <li>• Programming techniques using assembly language and C/C++</li> <li>•</li> </ul>		
<b>Module 2.</b>		<b>7 Hours</b>
<p>Real-Time Operating Systems (RTOS)</p> <ul style="list-style-type: none"> <li>• Introduction to real-time operating systems</li> <li>• Characteristics and requirements of RTOS</li> <li>• Task scheduling, synchronization, and communication in RTOS</li> </ul> <p>Embedded System Development Tools</p>		



<ul style="list-style-type: none"> <li>• Integrated Development Environments (IDEs) for embedded programming</li> <li>• Debugging tools and techniques (e.g., JTAG, In-circuit emulators)</li> <li>• Simulators and hardware-in-the-loop (HIL) testing</li> </ul>	
<b>Module 3.</b>	<b>8 Hours</b>
<p>Interfacing Techniques</p> <ul style="list-style-type: none"> <li>• Analog and digital interfacing techniques</li> <li>• Sensor interfacing (e.g., temperature sensors, accelerometers)</li> <li>• Actuator interfacing (e.g., motors, relays)</li> </ul> <p>Communication Protocols for Embedded Systems</p> <ul style="list-style-type: none"> <li>• Serial communication protocols (e.g., UART, SPI, I2C)</li> <li>• Wireless communication standards (e.g., Bluetooth, Wi-Fi)</li> <li>• Internet of Things (IoT) protocols (e.g., MQTT, CoAP)</li> </ul>	
<b>Module 4:</b>	<b>8 Hours</b>
<p>Embedded Systems Design and Development</p> <ul style="list-style-type: none"> <li>• Design methodologies for embedded systems</li> <li>• Hardware and software co-design considerations</li> <li>• Case studies of embedded systems projects</li> </ul> <p>Real-Time Embedded Systems</p> <ul style="list-style-type: none"> <li>• Characteristics of real-time embedded systems</li> <li>• Timing analysis and deadlines in real-time systems</li> <li>• Real-time operating systems and scheduling algorithms</li> </ul>	
<p><b>Recommended Textbooks:</b></p> <ul style="list-style-type: none"> <li>• "Embedded Systems: Introduction to ARM Cortex-M Microcontrollers" by Jonathan W. Valvano</li> <li>• "Programming Embedded Systems in C and C++" by Michael Barr and Anthony Massa</li> <li>• "Real-Time Embedded Systems: Design Principles and Engineering Practices" by Xiacong Fan</li> </ul>	



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	<b>MOBILE SEVICING</b>	
	<b>Duration: 30 Hours</b>	<b>Course code: EC-MS</b>
<b>Course Description:</b> <p>The Mobile Servicing course provides students with a comprehensive understanding of mobile devices, including smartphones and tablets, their components, functionality, and common issues encountered. Through theoretical instruction, hands-on laboratory sessions, and practical exercises, students will learn the principles of mobile servicing, diagnosis, repair, and maintenance. Emphasis will be placed on troubleshooting techniques, hardware and software repair, and customer service skills in the context of mobile device servicing.</p>		
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. Understand the basic principles of mobile device technology and functionality.</li> <li>2. Gain proficiency in diagnosing hardware and software issues in mobile devices.</li> <li>3. Learn repair and maintenance techniques for common mobile device problems.</li> <li>4. Develop skills in disassembly, assembly, and soldering of mobile device components.</li> <li>5. Acquire knowledge of tools, equipment, and safety precautions used in mobile servicing.</li> <li>6. Enhance customer service skills for interacting with clients and addressing their needs.</li> </ol>		
<b>Module 1:</b>		<b>7 Hours</b>
<p>Introduction to Mobile Device Technology</p> <ul style="list-style-type: none"> <li>• Overview of mobile device components and architecture</li> <li>• Evolution of mobile technology and trends in the industry</li> <li>• Introduction to mobile operating systems (e.g., Android, iOS)</li> </ul> <p>Tools and Equipment for Mobile Servicing</p> <ul style="list-style-type: none"> <li>• Essential tools and equipment for mobile device repair</li> <li>• Use of hand tools, soldering stations, and testing instruments</li> <li>• Safety precautions and best practices in mobile servicing</li> <li>•</li> </ul>		
<b>Module 2.</b>		<b>7 Hours</b>
<p>Mobile Device Disassembly and Assembly</p> <ul style="list-style-type: none"> <li>• Disassembly procedures for common mobile device models</li> <li>• Handling and removal of components (e.g., battery, display, motherboard)</li> <li>• Assembly techniques and precautions to prevent damage</li> </ul> <p>Diagnostic Techniques for Mobile Devices</p> <ul style="list-style-type: none"> <li>• Troubleshooting hardware and software issues in mobile devices</li> <li>• Use of diagnostic software and testing methodologies</li> </ul>		



<ul style="list-style-type: none"> <li>Identifying common problems (e.g., display issues, charging problems, software crashes)</li> </ul>	
<b>Module 3.</b>	<b>8 Hours</b>
<p>Hardware Repair and Replacement</p> <ul style="list-style-type: none"> <li>Repairing or replacing damaged components (e.g., screen replacement, battery replacement)</li> <li>Soldering and desoldering techniques for electronic components</li> <li>Handling and reballing of integrated circuits (ICs)</li> </ul> <p>Software Repair and Troubleshooting</p> <ul style="list-style-type: none"> <li>Software troubleshooting techniques (e.g., factory reset, firmware update)</li> <li>Dealing with software issues such as boot loops, freezing, and software corruption</li> <li>Introduction to mobile device flashing and unlocking procedures</li> </ul>	
<b>Module 4:</b>	<b>8 Hours</b>
<p>Water Damage Restoration</p> <ul style="list-style-type: none"> <li>Assessment and treatment of water-damaged mobile devices</li> <li>Cleaning and drying techniques for water-damaged components</li> <li>Preventive measures and waterproofing solutions</li> </ul> <p>Mobile Device Security and Data Protection</p> <ul style="list-style-type: none"> <li>Importance of data security and privacy in mobile servicing</li> <li>Data backup and recovery techniques</li> <li>Procedures for handling sensitive customer data</li> </ul>	
<b>Recommended Textbooks:</b>	
<ul style="list-style-type: none"> <li>"Mobile Phone Repairing: Step-by-Step Guide" by Channa Daniel</li> <li>"Mobile Device Repair and Maintenance: A Comprehensive Guide" by Jason Morris</li> <li>"The Complete Mobile Phone Repair Guide: How to Fix Your Smartphone" by Alex Crow</li> </ul>	

