DEPARTMENT OF

ELECTRONICS AND COMMUNICATION

ENGINEERING

MASTER OF TECHNOLOGY

in

CYBER PHYSICAL SYSTEMS

(Full Time)

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY

BHOPAL, INDIA

2024

Contents

Postgraduate Course

As the demand of complex software systems increases in our lives, such as infrastructure, transportation, and health. The trend for the future is to adopt new autonomous systems, such as self-driving cars, drones, and robots.

The core aspects of such Cyber-Physical Systems (CPS) are the interaction with the physical world and the communication with other systems. These aspects pose new challenges to design and implement reliable, secure, and performant software and require an interdisciplinary approach from Computer Science, Robotics, Embedded Systems, and Artificial Intelligence.

The master programme in CPS is to enable diploma or undergraduate students to substantiate their findings gained so far with theoretical knowledge in order to meet the challenges of modern research and development tasks significantly. The graduates are to be qualified for creative work in research and development departments.

IIIT Bhopal is offering M.Tech program in Cyber-Physical Systems under the department of Electronics and Communication Engineering (ECE), spanning two years. The academic calendar is structured into odd semesters (July to December) and even semesters (January to June) for each academic session.

The study programme consists of four semesters and is completed by an independent master dissertation. The master programme is module-based and encompasses four study semesters. In total, students can acquire 78 credit points.

1   Program Educational Objectives [PEOs]

PEO1: Graduates demonstrate proficiency in computation, communication and controls by applying theory to practice for meeting the expectations of industry.

PEO2: Graduates possess capability to take up research work in multi-disciplinary areas with environment protection and safety concern.

PEO3: Graduates are adaptable to diverse working environments, possess good communication skills and leadership quality.

PEO4: Graduates are capable of adopting latest developments by life-long learning with professional and ethical uprightness and socio-economic concerns.

2 Program Outcomes [POs]

PO1: Ability to demonstrate capabilities in the CPS technologies for IoT, embedded systems, wireless technologies, intelligent systems and related area.

PO2: Ability to take-up product design and development jobs in industry.

PO3: Ability to express system-level understanding and demonstration of the ideas and solutions in interdisciplinary areas.

PO4: Ability to innovate and contribute to tech companies, research organizations or start-ups.

PO5: Ability to understand, analyse and synthesise problems on significant CPS and capable to develop different business and research concepts.

3 Curriculum Structure

Teaching of the courses shall be reckoned in credits. Credits are assigned to the courses based on general patterns as shown in Table 1.

Table 1: Definition of Credits

1 hour of Lecture (L) per week	1 Credit
1 hour of Tutorial (T) per week	1 Credit
2 hours of Laboratory (P) per week	1 Credit

Total 78 Credit is required for this Program and distribution of Credits of program is shown in Table 2.

Table 2: Distribution of Credits

Semester	Periods Per Week			Credits
	L	T	P	
First Semester	15	03	06	21
Second Semester	11	06	08	21
Third Semester	0	0	32	16
Fourth Semester	0	0	40	20
Total	26	09	86	78

Credit structure of each course is given in L-T-P form (e.g., 2–1–0). The numbers corresponding to L, T and P denote the contact hours per week for Lecture, Tutorial and Practical respectively.

3.1   Definition of Course Code

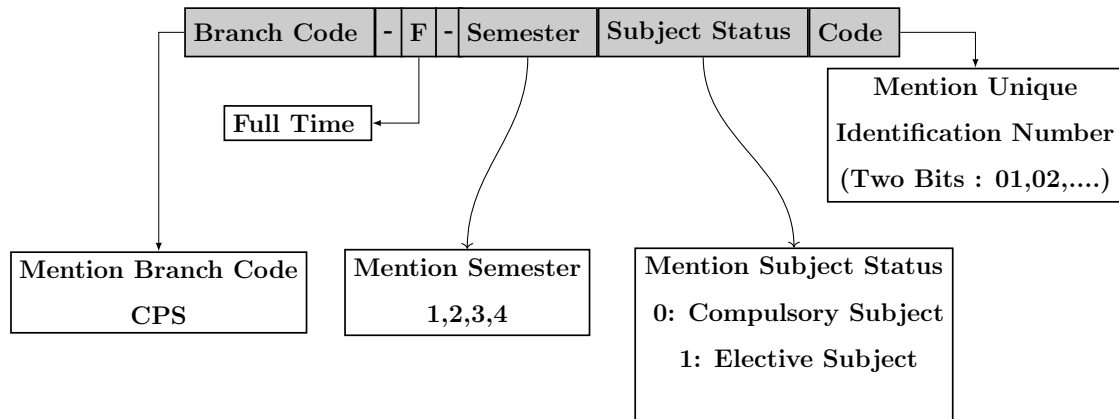Course Code Conversion is carried out according to scheme mentioned in Figure 1.

Figure 1: Course Code Nomenclature

3.2   Scheme

Semester-wise scheme and credit distribution mentioned in Tables.

Table 3: First Semester Scheme

Course Code	Subject Name	Periods Per Week			Credits
		L	T	P	
CPS-F-1001	Fundamentals of Cyber Physical Systems	3	1	-	4
CPS-F-1002	Sensors and Interfacing	3	1	-	4
CPS-F-1003	Control System Design	3	-	2	4
CPS-F-1004	Data Communication and Networking	3	-	2	4
CPS-F-11XX	Elective - I	3	1	-	4
CPS-F-1005	Cyber Physical Systems Lab- I	-	-	2	1
Total L = 15, T = 3, P = 6		Total Credits			21

Note- XX replaced with Subject code mentioned in Table 7

Table 4: Second Semester Scheme

Course Code	Subject Name	Periods Per Week			Credits
		L	T	P	
CPS-F-2001	Cyber Physical System Design	3	1	-	4
CPS-F-2002	Blockchain and IoT	2	1	2	4
CPS-F-2003	Embedded Systems-Design and Programming	2	1	2	4
CPS-F-21XX	Elective - II	2	1	-	3
CPS-F-21XX	Elective - III	2	1	-	3
CPS-F-2004	Research Innovation and Entrepreneurship	-	1	2	2
CPS-F-2005	Cyber Physical Systems Lab- II	-	-	2	1
Total L = 11, T = 6, P = 8		Total Credits			21

Note- XX replaced with Subject code mentioned in Table 8-9

Table 5: Third Semester Scheme

| Course Code | Subject Name | Periods Per Week | | | Credits |
		L	T	P	
CPS-F-3001	Dissertation Phase - I	-	-	32	16
Total L = 0, T = 0, P = 32		Total Credits			16

Table 6: Fourth Semester Scheme

| Course Code | Subject Name | Periods Per Week | | | Credits |
		L	T	P	
CPS-F-4001	Dissertation Phase - II	-	-	40	20
Total L = 0, T = 0, P = 40		Total Credits			20

3.3 List of Elective Subjects

Table 7: Subjects for Elective-I

Course Code	Subject Name
CPS-F-1101	Computer Architecture and Organization
CPS-F-1102	Data Structures and Algorithms
CPS-F-1103	Python Programming
CPS-F-1104	Mechatronics and Automation
CPS-F-1105	Measurement and Instrumentation
CPS-F-1106	Microprocessors and Microcontrollers
CPS-F-1107	Semiconductor Device Theory
CPS-F-1108	Digital Image Processing
CPS-F-1109	Adaptive Signal Processing
CPS-F-1110	FPGA Based System Design

Table 8: Subjects for Elective-II

Course Code	Subject Name
CPS-F-2101	Introduction to AI and ML
CPS-F-2102	Soft Computing Techniques
CPS-F-2103	Optimization Techniques
CPS-F-2104	Nonlinear Control Theory
CPS-F-2105	Advanced Additive Manufacturing
CPS-F-2106	Photonic Integrated Circuits
CPS-F-2107	Automotive Electronics
CPS-F-2108	Wireless Sensor Technology
CPS-F-2109	Low power VLSI Design
CPS-F-2110	Advanced Digital Signal Processing
CPS-F-2111	5G Communications and Beyond
CPS-F-2112	Interconnect Device Modelling and Packaging

Table 9: Subjects for Elective-III

Course Code	Subject Name
CPS-F-2113	Virtual Reality and Augmented Reality
CPS-F-2114	Fundamentals of Deep Learning
CPS-F-2115	Biomedical Instrumentation
CPS-F-2116	Industrial Process Control
CPS-F-2117	Advanced Robotics
CPS-F-2118	Real Time Systems
CPS-F-2119	Opto Nano Electronics
CPS-F-2120	Silicon Photonics
CPS-F-2121	Advanced VLSI
CPS-F-2122	Wavelets and Multiresolution Technique
CPS-F-2123	Microwave Devices and Circuits
CPS-F-2124	Computer Vision