REQUISITION LETTER

From,

Head of the Department,

Mechanical Engineering,

J.K.K Munirajah College of Technology,

T.N.Palayam.

To,

The Principal,

J.K.K Munirajah college of Technology,

T.N.Palayam.

Respected Sir,

Sub: Seeking permission for conducting a Certificate Program-reg

We have planned to conduct a certificate Program for I and II year ME-Manufacturing and II, III and IV year BE-Mechanical students on **"Machine Learning Applications in Industry 5.0"** from **20.11.2023** to **25.11.2023** by program coordinator Mr.M.SIVAKUMAR, M.E, AP/MECH. So, I request you to kindly provide permission to conduct the certificate Program.

Thanking You,

Place: T.N.Palayam

Date: 03.11.2023

Yours Truly,

[K. SRIRAM]
HoD/MECH

Permitted
3/11/23

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JKKMCT/CIRCULAR/195/NOV-23

06.11.2023

CIRCULAR

The Department of Mechanical Engineering is planning to organize a Certificate Program on **"MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0"** for the benefit of the students from 20.11.2023 (Monday) to 25.11.2023 (Saturday). Students those who are willing to attend this certificate program can enroll their names to their class in-charges respectively on or before 10.11.2023.

6/11/23

PRINCIPAL

Copy To

All the HODs and Staff Members,

All the students,

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

Program Name : MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0

Program Code : 23MEMLAICP01

Program Coordinator Name : Mr.M.SIVAKUMAR, M.E **Total Hours:** 36 hrs

PROGRAM SYLLABUS

CHAPTER 1: INTRODUCTION TO INDUSTRY 5.0

- Evolution from Industry 4.0 to Industry 5.0: Human-Centric and Sustainability Focus
- Key Pillars of Industry 5.0
- Role of Machine Learning in Advancing Industry 5.0
- Human-Machine Collaboration: Co-Bots and AI
- Enhanced Decision-Making through AI and ML
- Case Studies: Real-World Applications of Industry 5.0

CHAPTER 2: ENABLING TECHNOLOGIES FOR INDUSTRY 5.0

- Introduction to Edge and Fog Computing
- Advanced IoT Systems: Smart Manufacturing Networks
- Role of Cloud and Edge AI in Manufacturing
- Data Analytics for Real-Time Decision Support
- Advanced Machine Learning Algorithms for Hyper-Personalization
- AI-Powered Quality Assurance and Predictive Maintenance

CHAPTER 3: DIGITAL TWIN AND AUGMENTED INTELLIGENCE

- Digital Twin Integration with Machine Learning
- Predictive Analytics through Digital Twin Models
- Enhancing Human Intelligence with AI: Decision Augmentation
- Tools and Platforms for Building Digital Twins in Industry 5.0
- Case Studies: ML-Driven Digital Twin Deployments

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CHAPTER 4: INTELLIGENT AUTOMATION AND ROBOTICS

- Machine Learning in Robotics: Training Collaborative Robots (Cobots)
- AI-Driven Autonomous Vehicles and Navigation Systems
- Machine Vision Enhanced by ML for Inspection and Quality Control
- Real-Time Robotic Process Automation with ML Integration
- Case Studies: Intelligent Robotics in Smart Factories

CHAPTER 5: CYBERSECURITY AND TRUST IN INDUSTRY 5.0

- Cybersecurity Challenges in AI-Driven Manufacturing
- Securing Machine Learning Models Against Adversarial Attacks
- Blockchain and Federated Learning for Secure Data Sharing
- Trustworthy AI in Smart Manufacturing Systems
- Standards and Protocols for Cybersecurity in Industry 5.0

CHAPTER 6: SUSTAINABLE AND HUMAN-CENTRIC MANUFACTURING

- Leveraging ML for Energy Efficiency and Resource Optimization
- AI-Driven Waste Management and Circular Economy Practices
- Building Adaptive and Resilient Supply Chains with ML
- Disaster Recovery and Risk Management Using Machine Learning
- Social and Ethical Considerations in Human-Centric Manufacturing
- Case Studies: Sustainability Success Stories in Industry 5.0

Prepared by:

Name : Mr.M.SIVAKUMAR, M.E

Designation : Assistant Professor /Mechanical

M.

PROGRAM COORDINATOR **HOD** **PRINCIPAL**

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

PROGRAM SCHEDULE

Title of the Course : MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0

Period : 20.11.2023 to 25.11.2023

Date	09:30 AM to11:30AM (2 Hrs)	BREAK	11.45 AM to 1.45 PM (2 Hrs)	LUNCH	2:30 PM to 4.30 PM (2 Hrs)
20.11.2023	Evolution from Industry 4.0 to Industry 5.0: Human-Centric and Sustainability Focus Key Pillars of Industry 5.0		Role of Machine Learning in Advancing Industry 5.0 Human-Machine Collaboration: Co-Bots and AI		Enhanced Decision-Making through AI and ML Case Studies: Real-World Applications of Industry 5.0
21.11.2023	Introduction to Edge and Fog Computing Advanced IoT Systems: Smart Manufacturing Networks		Role of Cloud and Edge AI in Manufacturing Data Analytics for Real-Time Decision Support		Advanced ML Algorithms for Hyper-Personalization AI-Powered Quality Assurance and Predictive Maintenance
22.11.2023	Digital Twin Integration with Machine Learning Predictive Analytics through Digital Twin Models		Enhancing Human Intelligence with AI: Decision Augmentation Tools and Platforms for Building Digital Twins		Case Studies: ML-Driven Digital Twin Deployments
23.11.2023	ML in Robotics: Training Collaborative Robots (Cobots) AI-Driven Autonomous Vehicles and Navigation Systems		Machine Vision Enhanced by ML for Inspection and Quality Control Real-Time Robotic Process Automation with ML Integration		Case Studies: Intelligent Robotics in Smart Factories
24.11.2023	Cybersecurity Challenges in AI-Driven Manufacturing Securing Machine Learning Models Against Adversarial Attacks		Cybersecurity Challenges in AI-Driven Manufacturing Securing Machine Learning Models Against Adversarial Attacks		Blockchain and Federated Learning for Secure Data Sharing Trustworthy AI in Smart Manufacturing Systems
25.11.2023	Leveraging ML for Energy Efficiency and Resource Optimization AI-Driven Waste Management and Circular Economy Practices		Building Adaptive and Resilient Supply Chains with ML Disaster Recovery and Risk Management Using ML		Social and Ethical Considerations in Human-Centric Manufacturing Case Studies: Sustainability Success Stories in Industry 5.0

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

RESOURCE PERSON PROFILE

Title of the Program	MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0
Duration and Timing of the Program	20.11.2023 to 25.11.2023
Name of the Resource Person	Mr.M.SIVAKUMAR, M.E
Photo Image of the Resource Person	
E-mail	sivakumarm@jkkmct.edu.in
Mobile No:	+919597553594
Designation	Assistant Professor /Mechanical
Official Address	Department of Mechanical Engineering, JKKMCT,T.N.Palayam-638506,Erode (Dt)
Educational Qualification	B.E (Mechanical Engineering), M.E (Engineering Design)
Experience	12 years of Teaching Experience as Assistant Professor and 02 years of industrial experience
Field of Interest	Industry 5.0, Advanced Machining Process, 3D Printing Technology

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

STUDENT WILLING LIST

S.NO	REGISTER NO	STUDENT NAME	WILLING STUDENTS SIGNATURE
1.	731222410001	JAGADEESH	
2.	731222410002	MITTU S THAMPI	
3.	731222410003	MUKILAN S	
4.	731223410002	VINOTH KUMAR K	
5.	731220114001	JAGANKUMAR S	
6.	731220114002	KODEESWARAN S	
7.	731220114003	KUMARAVEL M	
8.	731220114004	MAHENDRAN D	
9.	731220114005	MANIKANDAN S	
10.	731220114006	PARTHIPAN M	
11.	731220114007	RAMESH B	
12.	731220114008	RAVINDRAN L	← NOT WILLING →
13.	731220114010	SENTHILKUMAR G	
14.	731220114011	THIRUMURUGAN M	
15.	731220114012	THIRUNAVUKKARASU S	
16.	731220114013	VELLINGIRI A	
17.	731220114301	GOWRISANKAR M	
18.	731220114302	KAVIN A	
19.	731220114501	PALANIKUMAR M	
20.	731221114004	MATHANKUMAR M	
21.	731221114005	PRABAKARAN S	
22.	731221114008	SATHEESH C	
23.	731221114009	VAIRAMUTHU S	

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24.	731221114010	VIGNESH S	
25.	731222114001	ARUN S	
26.	731222114002	GOWTHAM V	
27.	731222114003	JEEVA P	
28.	731222114005	NAVEENKUMAR N	
29.	731222114006	PARTHASARATHI R	
30.	731222114007	RAGUPATHI R	
31.	731222114008	RAJESHKUMAR K	
32.	731222114010	SANTHOSH M	
33.	731222114012	SIVAKUMAR M	
34.	731222114013	SURIYAKUMAR S	
35.	731222114014	YOGAPRAKASH M	
36.	731222114303	DURAI ANBARASU S	
37.	731222114304	POOVARASU M	
38.	731222114305	RAGU B	

PROGRAM COORDINATOR **HOD** **PRINCIPAL**

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

ENROLLED STUDENTS NAME LIST

S.NO	REGISTER NO	STUDENT NAME
1.	731222410001	JAGADEESH M
2.	731222410002	MITTU S THAMPI
3.	731222410003	MUKILAN S
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24.	731222114001	ARUN S

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

CERTIFICATE PROGRAM ON "MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0"

ATTENDANCE SHEET

Schedule Period: 20.11.2023 to 25.11.2023

S.NO	NAME OF THE STUDENT	ATTENDANCE OF THE PARTICIPANTS											
		20/11/23		21/11/23		22/11/23		23/11/23		24/11/23		25/11/23	
		FN	AN	FN	AN	FN	AN	FN	AN	FN	AN	FN	AN
ME- I YEAR													
1.	JAGADEESH M	/	/	/	/	/	/	/	/	/	/	/	/
2.	MITTU S THAMPI	/	/	/	/	/	/	/	/	/	/	/	/
3.	MUKILAN S	/	/	/	/	/	/	A	/	/	/	/	/
ME- II YEAR													
4.	VINOTH KUMAR K	/	/	/	/	/	/	/	/	/	/	/	/
BE- II YEAR													
5.	ARUN S	/	/	/	/	/	/	/	/	/	/	/	/
6.	GOWTHAM V	/	/	/	A	A	/	/	/	/	A	A	/
7.	JEEVA P	/	A	/	/	/	/	/	/	/	/	/	/
8.	NAVEENKUMAR N	/	/	/	/	/	/	/	/	A	/	/	/

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9.	PARTHASARATHI R	/	/	/	/	/	/	/	/	/	/	/	/
10.	RAGUPATHI R	/	/	/	/	/	/	/	/	/	/	/	/
11.	RAJESHKUMAR K	/	/	/	A	/	/	/	/	/	/	/	/
12.	SANTHOSH M	/	/	/	/	/	/	/	/	/	A	/	/
13.	SIVAKUMAR M	A	/	/	/	/	/	/	/	/	/	/	/
14.	SURIYAKUMAR S	/	/	/	/	/	/	/	/	/	/	/	/
15.	YOGAPRAKASH M	/	/	/	/	/	/	/	/	/	/	/	/
16.	DURAI ANBARASU S	/	/	/	/	/	/	/	/	/	/	/	/
17.	POOVARASU M	/	/	/	/	/	/	/	/	/	/	/	/
18.	RAGU B	/	/	/	/	/	/	/	/	/	/	/	/
	BE-III YEAR												
19.	MATHANKUMAR M	/	A	/	/	A	A	/	/	/	/	A	/
20.	PRABAKARAN S	/	/	/	/	/	/	/	/	/	/	/	/
21.	SATHEESH C	/	/	/	/	/	/	/	/	/	/	/	/
22.	VAIRAMUTHU S	/	/	/	/	A	/	/	/	/	/	/	/
23.	VIGNESH S	/	/	/	/	/	/	/	/	/	/	/	/
	BE-IV YEAR												
24.	JAGANKUMAR S	/	/	/	/	/	/	/	/	/	/	/	/
25.	KODEESWARAN S	/	/	/	/	/	/	/	/	/	/	/	/
26.	KUMARAVEL M	/	/	/	/	/	/	/	/	/	/	/	/
27.	MAHENDRAN D	/	/	/	/	/	/	/	/	/	/	/	/
28.	MANIKANDAN S	A	/	/	/	/	/	A	/	/	/	/	/
29.	PARTHIPAN M	/	/	/	/	/	/	/	/	/	/	/	/
30.	RAMESH B	/	/	/	/	/	/	/	/	/	/	/	/

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31.	SENTHILKUMAR G	/	/	A	/	/	/	/	/	/	/	/	/
32.	THIRUMURUGAN M	/	/	/	/	/	/	/	/	/	/	/	/
33.	THIRUNAVUKKARASU S	/	/	/	/	/	/	/	/	/	A	/	/
34.	VELLINGIRI A	/	/	/	/	A	/	/	/	/	/	/	/
35.	GOWRISANKAR M	/	/	/	/	/	/	/	/	/	/	/	/
36.	KAVIN A	/	/	/	/	/	/	/	/	/	/	/	/
37.	PALANIKUMAR M	/	/	/	/	/	/	A	/	/	/	/	/
Total Number of Present		35	35	36	35	33	36	34	37	36	34	35	37
Total Number of Absent		02	02	01	02	04	01	03	0	01	03	02	0
Signature of Program Coordinator		M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
Signature of HoD													

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

ASSESSMENT – "MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0"

ANSWER ALL THE QUESTIONS (15x2=30 MARKS)

1. **What is a key benefit of applying machine learning in Industry 5.0?**
   A) Automates all processes
   B) Enhances human-machine collaboration
   C) Reduces need for any human intervention
   D) Completely eliminates errors
2. **Which type of machine learning is commonly used for predictive maintenance in industries?**
   A) Supervised learning
   B) Unsupervised learning
   C) Reinforcement learning
   D) Semi-supervised learning
3. **What is the role of neural networks in Industry 5.0 applications?**
   A) Data storage
   B) Pattern recognition
   C) Physical automation
   D) Energy management
4. **Which type of data is most commonly used for training machine learning models in Industry 5.0?**
   A) Categorical data
   B) Real-time sensor data
   C) Text data
   D) Image data
5. **What is a primary goal of Industry 5.0?**
   A) Replace humans with robots
   B) Achieve complete automation
   C) Harmonize human intelligence with advanced technology
   D) Reduce production capacity

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6. **What is the key feature of reinforcement learning in the context of industrial applications?**
   A) Uses labeled data for predictions
   B) Learns through trial and error
   C) Requires no human supervision
   D) Relies solely on pre-set rules
7. **What does "IoT" stand for, as commonly integrated with machine learning in Industry 5.0?**
   A) Internet of Technology
   B) Integration of Things
   C) Internet of Things
   D) Innovation of Technology
8. **Which algorithm is commonly used for anomaly detection in industrial processes?**
   A) Decision Trees
   B) K-Means Clustering
   C) Gradient Boosting
   D) Naive Bayes
9. **What does "digital twin" refer to in Industry 5.0?**
   A) A physical clone of a machine
   B) A virtual model of a physical system
   C) A robotic assistant for workers
   D) A type of machine learning algorithm
10. **How is machine learning applied in quality control processes?**
    A) By replacing inspection staff
    B) By identifying defects through pattern recognition
    C) By automating product assembly
    D) By optimizing production speed
11. **Which tool is commonly used for training machine learning models in industries?**
    A) SolidWorks
    B) TensorFlow
    C) AutoCAD
    D) MATLAB

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12. **What is a common challenge in using machine learning for industrial applications?**
    A) Lack of computational power
    B) Data scarcity
    C) High human dependency
    D) Limited real-world applications
13. **What is the primary role of explainable AI in Industry 5.0?**
    A) Enhance prediction accuracy
    B) Enable machines to work without humans
    C) Make AI decisions understandable to humans
    D) Increase automation efficiency
14. **Which of the following is an advantage of integrating machine learning with robotics in Industry 5.0?**
    A) Decreased operational costs
    B) Reduced human-machine interaction
    C) Autonomous decision-making without errors
    D) Faster but less accurate operations
15. **What is a critical ethical concern when implementing machine learning in Industry 5.0?**
    A) High computational costs
    B) Lack of skilled personnel
    C) Data privacy and security
    D) Limited industrial use cases

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

CONSOLIDATED STUDENTS NAME LIST

S.NO	REGISTER NO	STUDENT NAME	MARK
1.	731222410001	JAGADEESH M	93
2.	731222410002	MITTU S THAMPI	87
3.	731222410003	MUKILAN S	67
4.	731223410002	VINOTH KUMAR K	73
5.	731220114001	JAGANKUMAR S	73
6.	731220114002	KODEESWARAN S	73
7.	731220114003	KUMARAVEL M	87
8.	731220114004	MAHENDRAN D	60
9.	731220114005	MANIKANDAN S	67
10.	731220114006	PARTHIPAN M	87
11.	731220114007	RAMESH B	60
12.	731220114010	SENTHILKUMAR G	67
13.	731220114011	THIRUMURUGAN M	78
14.	731220114012	THIRUNAVUKKARASU S	73
15.	731220114013	VELLINGIRI A	74
16.	731220114301	GOWRISANKAR M	67
17.	731220114302	KAVIN A	93
18.	731220114501	PALANIKUMAR M	73
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PROGRAM COORDINATOR **HOD** **PRINCIPAL**

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DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR: 2023-2024

SUMMARY/ OUTCOME REPORT

Name of the Certificate Course : MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0

Course Code : 23MEMLAICP01

Name of the Course Coordinator : Mr.M.SIVAKUMAR, M.E,

I hereby confirm that the entire course contents in the Certificate Program **"MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0"** listed in the course syllabus have been actually performed by the students as part of the prescribed co-curricular activities through the program.

I confirmed that the certificate program title, **MACHINE LEARNING APPLICATIONS IN INDUSTRY 5.0,** was done by me in the beginning of this semester, and course delivery with attendance of the students was recorded.

I confirmed that all registered students for this certificate program were actively attending and performed well throughout the duration of this course. And all students successfully completed and were eligible to receive the participation certificate.

OUTCOME:

- Students shall be able to understand and apply machine learning techniques for optimizing industrial processes and systems in the context of Industry 5.0.
- This course provides a comprehensive overview of integrating machine learning into smart manufacturing, human-machine collaboration, and sustainable industrial practices.
- Students shall be equipped with the skills to analyze, design, and deploy machine learning applications for enhancing efficiency and innovation in Industry 5.0 environments.

Signature:

Name : Mr.M.SIVAKUMAR, M.E

Designation : Assistant Professor /Mechanical

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