AICTE Training And Learning (ATAL) Workshop

On

Robotics

10th –14th December, 2019

REGISTRATION FORM

Name: ……

Designation: .....

Organization: .....

Qualification: .....

Correspondence Address: .....

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Tel. (O) ..... (R) .....

(M) .....

E-Mail: .....

Date: Place:

Signature of Candidate

Signature of Principal/HOD

Note: The participants to the course will be faculty & Ph.D Scholars from AICTE approved technical institutions.

Chief Patron

Dr. N. S. Raghuwanshi, Director, MANIT Bhopal

Patron

Dr. Alok Mittal, Dean (R&C), MANIT Bhopal

Convener

Dr. Meenu Chawla

Department of Computer Science and Engineering

Coordinators

Dr. Vijay Bhaskar Semwal

Dr. Mitul Kumar Ahirwal

Address for Correspondence

Dr. Vijay Bhaskar Semwal

Assistant Professor

Department of Computer Science and Engineering, MANIT Bhopal

Email: vsemwal@gmail.com

Contact No.: 08874142887

Dr. Mitul Kumar Ahirwal

Assistant Professor

Department of Computer Science and Engineering, MANIT Bhopal

Email: ahirwalmitul@gmail.com

Contact No.: 09981216927

IMPORTANT DATES

Last date of receipt of application: 05-Decemberl-2019.

Notification about selection: By email.

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on

"Robotics"

10th –14th December, 2019

Organized by

Department of Computer Science & Engineering

Maulana Azad National Institute of Technology

Bhopal -462003 (Madhya Pradesh)

About the Institute:

Maulana Azad National Institute of Technology (MANIT), Bhopal started functioning in 1960 at Govt. S.V. Polytechnic with an intake of 120 students and seven faculty members. The Institute is successfully meeting the objective of producing skilled Technocrats of the highest quality who are able to take up the challenges of the industries and Research organizations of the country. MANIT offers various undergraduate and post graduate courses and research programs. The Institute is running 7 Engineering Disciplines, 2 Center of excellences and various M.Tech. programs. Institute is about to start center of excellence in Artificial Intelligence.

About Department:

The computer science and engineering department was established in the year 1986. Since the inception, it is consistently creating its place of excellence not only within the institute but among its counter parts in the country and abroad. Bright students from all the parts of the country for quality education in computer science and engineering at under graduate, post graduate, and doctoral levels are attracted. The department has highly qualified and competent faculty members, and adequate facilities to support teaching and learning activity.

Objective:

This course is designed to provide an exposure to the fundamentals of Robotics and Artificial Intelligence. Participants will learn kinematics and dynamics of industrial manipulators, Human Gait Analysis as Biometric Identification and walking pattern generation, Humanoid robot walking trajectories generation, kinematics of mobile robots, trajectory planning, path planning and control and how to embed intelligence in robotic tasks.

Hands-on training and practice sessions will help participants gain confidence on robotic concepts, their simulation and implementation including sessions on intelligent agents. The course will be useful for faculty of engineering and sciences, research scholars who are interested in the learning robotics and intelligent systems. In this workshop, the main focus will be the understanding of Human gait evolution and analysis. The main take away of work how brain used to learn the pattern in form of neural network. How brain used to control our walk and other behavior? How human walk is helpful for humanoid robot? Brief Introductions of humanoid robot. Depth analysis of Human joints trajectories for generation of adaptive walking trajectories computational model development. The work shop will be complete package as introduction of bipedal robotics.

Course contents:

Topics 1. Introduction to Robotics and Robot Simulators : Introduction to Robotics: Robot Manipulators, Mobile Robots, Legged Robot, Aerial Robots, Applications. Components and mechanisms of a robotic system, sensors and actuators.

Topics 2. Mathematical foundation of Robotics: Introduction to Manipulator, Coordinate System, classification, reachable and dexterous space, Forward and Inverse kinematics, DH Parameter Velocity Kinematics.

Hands on: Robot Simulation Software, Tutorials on Coordinate systems and Robot Kinematics : Webots, RoboAnalyzer

Topics 3.Introduction to Bipedal robotics: The main takeaways of this section are as following:

1- Introduction to Humanoid robotics.
2- Understanding of Human Gait and various analysis.
3- Solution of Inverse kinematics and dynamic and solution using data driven technique.
4- Introduction to neural network and deep learning.
5- Robot walking trajectories generation and Push Recovery.
6- Biomechanical analysis of human gait and joint.
7- Hands on practice on neural network.

Topics 4: More on AI and Machine Learning: Reinforcement Learning Introduction to Reinforcement Learning, Tabular Solution Methods – Multi-armed Bandits, Finite Markov Decision Processes, Dynamic Programming, Monte Carlo Methods, Temporal Difference Learning.

Topics 5: Topic Applications, Research Directions and Case Studies Research directions, and case studies. Mobile robotics – multi-terrain robots, humanoid robots. Biped locomotion; Applications in Agriculture, and Social robotics. Brain Computer Interface (BCI) and gesture control Hands on– Simulation of robot tasks and motion planning, Industrial manipulators and motion planning and hardware implementation.

List of suggested books:

1. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009
2. Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi.
3. Mittal R.K. et.al, "Robotics and Control", Tata McGraw Hill.
4. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005
5. Merzouki R., et.al,, "Intelligent Mechatronic System: Modeling, Control and Diagnosis", Springer.
6. Shuuji Kajita, et.al, "Introduction to Humanoid Robotics", springer
7. Robin R. Murphy, "Introduction to AI Robotics" MIT Press

Registration Details for Participants

The participants to the course will be faculty & Ph.D Scholars from AICTE approved technical institutions. **There is no Registration fee** from any participant. No TA/DA will be paid to any participant. Participants will have to make their own stay arrangement during the five days. Only tea during sessions/working lunch will be provided to the participants. On completion of the programme on all the days, participants will be awarded a Certificate of participation by respective ATAL Academy. **Registration link on Last Page.**

Registration Link:

https://docs.google.com/forms/d/e/1FAIpQLScBDZQLUEftU_AksgTMhjAlF2xpxnfg2tawd3wq0OxbwykKlw/viewform?usp=pp_url