TEACHING LEARNING CENTRE (TLC)

AN OVERVIEW OF ACTIVITIES

A Higher Education Teaching Learning Scheme Established under Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching Scheme (PMMMNMTT)

Pandit Madan Mohan Malaviya
Teaching Learning Centre Building
Project Coordinator: Prof. A. Ramachandraiah

Warangal - 506004, Telangana State

BRIEF PROFILE OF TLC AT NIT WARANGAL

We are very thankful to you for your regular updates on the activities of the PMMMNMTT Centers and for the situational guidance for our Teaching Learning Centre. We are also happy to inform you that the new Building named as "Pandit Madan Mohan Malaviya Teaching Learning Centre" built with funds from the TLC Project, has been recently (22nd October, 2020) has been inaugurated by the Hon'ble Minister of Education, Shri. Ramesh Pokhriyal 'Nishank' online by remote switch.

New Building of Pandit Madan Mohan Malaviya Teaching Learning Centre was Inaugurated by the Hon'ble Minister of Education, Shri. Ramesh Pokhriyal 'Nishank' on 22nd October, 2020

The Teaching Learning Centre building comprises of the state-of-art training facilities that include a studio for production of video and e-lectures, training halls, seminar halls, a computer lab for developing on-line courses and other learning resources, learning spaces for facilitating interaction among various stake holders. The center also has facilities for hosting on-line courses employing Learning Management Systems like MOODLE.

One of the important objectives of the Centre is to conduct Faculty Development Programmes (FDPs) for the aspiring, newly inducted and in-service faculty in science, engineering, social sciences disciplines in higher education in pedagogy, use of ICT in teaching. FDPs are also conducted in inter-disciplinary and emerging areas of Science and Technology like Nano-materials, Bioinformatics, 3D printing, Internet of Things Artificial Intelligence, Big-Data.

Other activities of the TLC include preparation of print and e-learning materials, offering on-line courses, curriculum design, carrying out research in educational technology, pedagogy, evaluation techniques and integrating ICT into teaching-learning process. Many senior and young faculty of NIT Warangal are associated with this Centre as Core-Team members.

STATISTICAL DATA

S. No	Activity	Number of Programmes Conducted	Number of Training Days	Number of Faculty Members Trained	Number of SC/ ST Participants Trained
1	**Faculty Development Programmes/ Workshops/ Training Programmes**	**68**	**335**	**3428**	**539**
2	**Four-Week Induction Training Programmes**	**3**	**90**	**128**	**26**
3	**Four-Day Faculty Training Programmes**	**1**	**12**	**313**	**54**
4	**Conferences**	**1**	**2**	**71**	**09**
	Total	**73**	**439**	**3940**	**628**

LIST OF ACTIVITIES ORGANIZED BY THE TEACHING LEARNING CENTRE OF NIT WARANGAL DURING 2016-2021

Sl. No.	Title of the Faculty Development Programme	Dates		Number of Days	Number of Participants
		From	To		
1	Pedagogical Skills for Teacher Aspirants in Science and Engineering Education	20-10-2016	25-10-2016	**6**	**46**
2	Pedagogical Skills for Teacher Aspirants in Science and Engineering Education	13-11-2016	18-11-2016	**6**	**37**
3	Instructional Design and Delivery Methods	12-11-2016	14-11-2016	**3**	**45**
4	Instructional Design and Delivery Methods	22-12-2016	24-12-2016	**3**	**35**
5	Technologies for Development and Delivery of Instructional Materials for e-Learning	08-12-2016	10-12-2016	**3**	**70**
6	Process Oriented Guided Inquiry Learning	12-12-2016	12-12-2016	**1**	**41**
7	Communication Skills for Effective Teaching in Higher Education	24-02-2017	26-02-2017	**3**	**75**
8	Concept based teaching and learning physics through experiments in undergraduate education	02-03-2017	04-03-2017	**3**	**57**
9	Free and Open Source Software in Teaching and Learning	04-03-2017	05-03-2017	**2**	**72**

Sl. No.	Title of the Faculty Development Programme	Dates		Number of Days	Number of Participants
		From	To		
10	Developing OER-enabled e-Learning Courses Using Moodle	18-03-2017	19-03-2017	2	44
11	Effective Teaching and Learning of Digital Electronics	21-03-2017	25-03-2017	5	42
12	Innovative Methods for Teaching Mechanical Engineering	22-03-2017	26-03-2017	5	60
13	Effective Teaching and Evaluation Methods in Engineering Education	01-04-2017	02-04-2017	2	57
14	Instructional Design and Delivery Methods in Engineering Education	01-05-2017	06-05-2017	6	48
15	Internet of Things	08-05-2017	13-05-2017	6	46
16	Developing Teaching Competencies in Teachers of Higher Education	13-05-2017	19-05-2017	7	76
17	Developing Teaching Competencies in Teachers of Higher Education	26-05-2017	31-05-2017	6	40
18	3D Printing Technology in Engineering Education	05-06-2017	10-06-2017	6	48
19	Internet of Things	05-06-2017	10-06-2017	6	38
20	Effective methods of teaching the course on 'Internal Combustion Engines and Alternate Power Sources for Automobiles'	19-06-2017	24-06-2017	6	55
21	Teaching and Learning Nano-Science and Technology through Hands-on Experiences	23-06-2017	27-06-2017	5	40
22	Modelling, Simulation and Product Design Practices in Engineering	03-07-2017	08-07-2017	6	33
23	3D Printing Technology in Engineering Education	10-07-2017	15-07-2017	6	45
24	Effective Teaching and Evaluation Methods in Technical Education	19-08-2017	20-08-2017	2	31
25	Teaching and Learning Chemical Spectroscopy Through Hands-on Experience	11-09-2017	16-09-2017	6	82
26	R-Programming Concepts and Applications for Teachers in Higher Education	13-09-2017	17-09-2017	5	38
27	Effective Teaching and Evaluation Methods in Technical Education	28-10-2017	29-10-2017	2	27
28	Evaluation, Grading and Micro-Teaching Practice	10-11-2017	11-11-2017	2	48
29	Induction Training Programme for Faculty in Universities / Colleges / Institutes of Higher Education (ITP-1)	27-11-2017	24-12-2017	30	35
30	Effective Teaching and Learning of Smart Grid and Microgrid Technologies	04-12-2017	08-12-2017	5	49
31	Effective Teaching and Learning of Geotechnical Engineering Using Field Practices and Case Studies	06-12-2017	10-12-2017	5	38
32	Big Image Data Processing Using Machine Learning Algorithms	11-12-2017	16-12-2017	6	61

Sl. No.	Title of the Faculty Development Programme	Dates		Number of Days	Number of Participants
		From	To		
33	Effective Teaching and Learning of Flexible Pavement Design	17-01-2018	21-01-2018	5	44
34	New Pedagogic Techniques in Technical Education	26-02-2018	03-03-2018	6	50
35	Free and Open Source Geospatial Technologies for Teachers in Higher Education	14-03-2018	18-03-2018	5	36
36	Computational Methods in Hydraulics and Water Resources Engineering	19-03-2018	24-03-2018	6	42
37	Modern Methods of Teaching, Learning and Evaluation in Engineering Education	25-03-2018	27-03-2018	3	41
38	Effective Teaching and Learning of Artificial Intelligence Techniques for Smart Grid Applications	03-04-2018	07-04-2018	5	44
39	Effective Teaching and Learning Practices for Design and Operation of Wastewater Treatment Systems	09-04-2018	13-04-2018	5	42
40	Induction Training Programme for Faculty in Universities / Colleges / Institutes of Higher Education (ITP-2)	09-04-2018	06-05-2018	30	36
41	Pedagogy and ICT in Higher Education	24-05-2018	29-05-2018	6	44
42	Induction Training Programme for Faculty in Universities / Colleges / Institutes of Higher Education (ITP-3)	11-06-2018 Phase-I 17-09-2018 Phase-II	30-06-2018 Phase-I 22-09-2018 Phase-II	30	57
43	Teaching and Learning of Fabrication of Thin Films and Optoelectronic devices through Hands-on experience	03-07-2018	08-07-2018	6	35
44	Teaching and Learning of Molecular Biology and Enzymology through Hands-on Experience	18-09-2018	23-09-2018	6	32
45	Evaluation and Grading Methods in Technical Education	03-11-2018	04-11-2018	2	50
46	Current Trends in Teaching Methods and Strategies in Higher Education	28-01-2019	02-02-2019	6	48
47	Teaching and Learning of Engineering Mathematics Using Python Through Hands-on Experience	05-03-2019	10-03-2019	6	31
48	Teaching and Learning Methods in Outcome-Based Engineering Education	29-03-2019	31-03-2019	3	36
49	Pedagogy and ICT in Higher Education	13-05-2019	18-05-2019	6	60
50	Effective Teaching and Learning Practices for Design and Operation of Water Supply Systems	20-05-2019	25-05-2019	6	41
51	Student Centered Teaching Methods and Strategies in Higher Education	03-06-2019	08-06-2019	6	73
52	Teaching and Learning Methods for Outcome Based Engineering Education	08-07-2019	13-07-2019	6	50
53	Effective Teaching and Evaluation Methods for Engineering Education	09-08-2019	11-08-2019	3	50

Sl. No.	Title of the Faculty Development Programme	Dates		Number of Days	Number of Participants
		From	To		
54	Teaching and Learning Nano-Science and Technology Through Hands-on Experience	10-02-2020	15-02-2020	6	38
55	Teaching Engineering Standards and Intellectual Property Rights for Academicians	13-02-2020	18-02-2020	6	51
56	Teaching and Learning of Advances in Physical Chemistry Through Hands-on Experience	17-02-2020	22-02-2020	6	48
57	Teaching and Learning of Modern Methods of Organic Chemistry Through Hands-on Experience	24-02-2020	29-02-2020	6	46
58	Instructional Strategies of Physical Methods in Chemical Analysis with Hands-On Experiments	02-03-2020	07-03-2020	6	46
59	International Conference on Women Empowerment: Innovative Methods and Strategies in Higher Education (WEIMSHE-2020)	06-03-2020	07-03-2020	2	71
60	Teaching & Learning of Functional Materials and Devices Through Hands-on Experience (TLFMD-2020)	09-03-2020	14-03-2020	6	42
61	Pedagogy Skills in Teaching Methods and Strategies in Higher Education (PSTMSHE-2020)	09-03-2020	14-03-2020	6	43
62	Teaching and Learning Practices of Data Analysis through Hands-on Experience	09-03-2020	14-03-2020	6	33
63	Innovative Teaching Methods on Recent Advances in Concrete and Sustainable Technologies	01-07-2020	05-07-2020	5	50
64	Emerging Trends in Biotechnological Advancements: Challenges and Prospects in Tackling Human Diseases	13-07-2020	17-07-2020	5	77
65	Teaching and Learning of Additive Manufacturing Technology: Emphasis on Metal 3D Printing	13-07-2020	18-07-2020	6	115
66	Learning Management System with MOODLE	14-07-2020	31-07-2020	12	313
67	Teaching and Learning of Advanced Control Systems	10-08-2020	16-08-2020	6	96
68	Recent Trends in Computer Simulations for applications in Biotechnology: Teaching and Learning Strategies	17-08-2020	21-08-2020	5	47
69	Advances in Biological Wastewater Treatment Methods: Teaching and Learning Strategies	07-09-2020	11-09-2020	5	85
70	Content Preparation and Delivery for Online Mode of Teaching	05-10-2020	10-10-2020	6	35
71	Teaching and Learning of Advance in Manufacturing Technologies	30-11-2020	04-12-2020	5	47
72	Teaching and Learning Strategies of Differential Equations and Applications in Science and Engineering	28-12-2020	01-01-2021	5	63
73	Modern Digital Library Science and Technologies for Teaching, Learning and Research	04-01-2021	08-01-2021	5	93
	Total Number of Activities Conducted : 73			**439**	**3940**

Photo gallery reflecting some of the glimpses of the activities conducted by the TLC of NIT Warangal

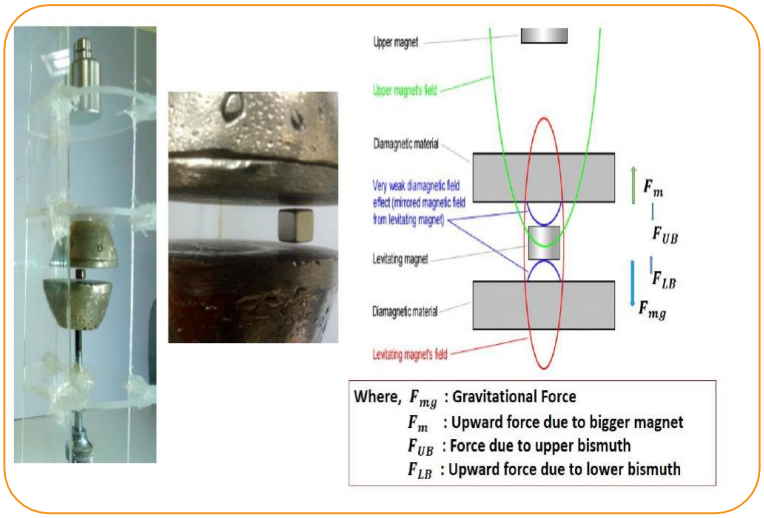
DEVELOPMENT OF TEACHING LEARNING MATERIALS

✓ **A few of the NIT Warangal faculty (26) belonging to different departments are involved in developing 16 teaching learning materials which include online courses, e-lab manuals, video lectures and instructional aids.**

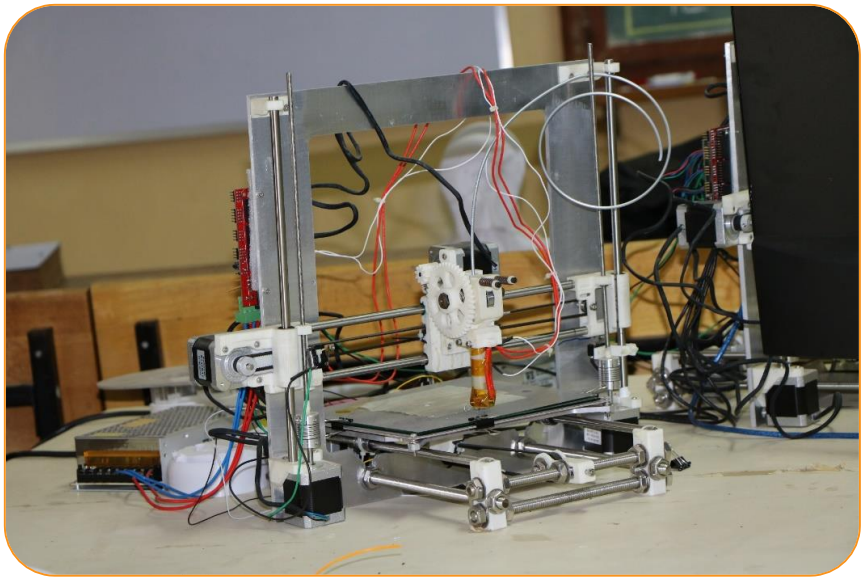
S. No	Name of the Developer and Designation	Title of Online Course / e-Lab Manual
1	Dr. K.V.R. Ravi Shanker Asst. Professor	Development of on-line course on Road Crash Reduction and Prevention
2	Dr. D. Ravi Prasad Asst. Professor	Development of on-line course on "Design of Pre-stressed Concrete Structures"
3	Dr. Venkata Reddy K Associate Professor	Development of e-content for teaching and learning of Geographical Information System (GIS)
4	Dr. M. Shashi Asst. Professor	Development of e-content for teaching and learning of Surveying
5	Dr. Harikumar V Associate Professor	Development of a Set of Simulation Experiments for use as a Teaching aid in Computer-Aided Design Course (CAD).
6	Dr. Y. Ravi Kumar Associate Professor	Design and Development of Low-Cost 3D Printer
7	Dr. Srikanth K Associate Professor	Development of Laboratory Manual for Experiments in Simulation Laboratory for Mechanical Engineers
8	Dr. U.S.N. Raju Asst. Professor	“Compiler Design” e-laboratory manual in multimedia form
9	Dr. Chapram Sudhakar Associate Professor	Development of Learner-Centered Laboratory Tool for Learning Component of an Operating System in Undergraduate Curriculum
10	Dr. R. R. Rout Asst. Professor	Development of an Improved Learning Tool for Cryptography in Undergraduate Laboratory Curriculum
11	Dr. D. Paul Joseph Assistant Professor	Development of Working Models to Demonstrate Real time Superconducting and Diamagnetic Levitation Using YBCO and Bismuth
12	Dr. K. Thangaraju Associate Professor	Development of Learner-Centered Laboratory Manual for Network Analysis Course
13	Dr. Sourabh Roy Assistant Professor	Development of On-line course in NANOPHOTONICS for Postgraduate and Ph.D Course Curriculum
14	Prof. A. Ramachandraiah Professor	Development of Learner – Centered Laboratory Manual for Physical Chemistry Experiments in Undergraduate Chemistry Laboratory Curriculum

15	Dr. D. Kashinath Associate Professor	Development of Learner - Centered Laboratory Manual for Advanced Organic Chemistry Experiments in Under Graduate and Post Graduate Laboratory Curriculum
16	Prof. K. Laxma Reddy Professor	Development of Learning Resource Manual for Inorganic Chemistry Experiments in Postgraduate Chemistry Laboratory Curriculum

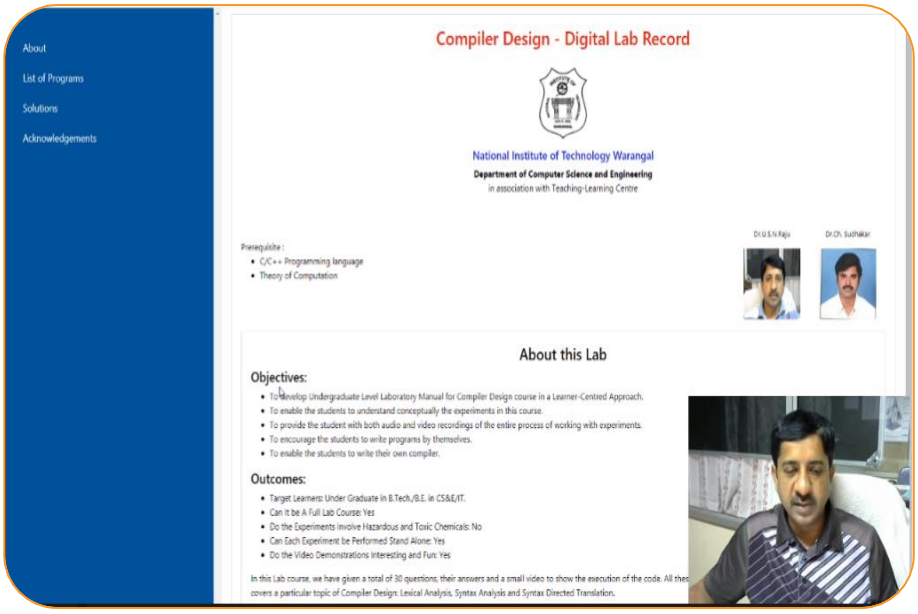
✓ **Some of the DTLMs developed by the Faculty Members of the NIT Warangal are given below:**



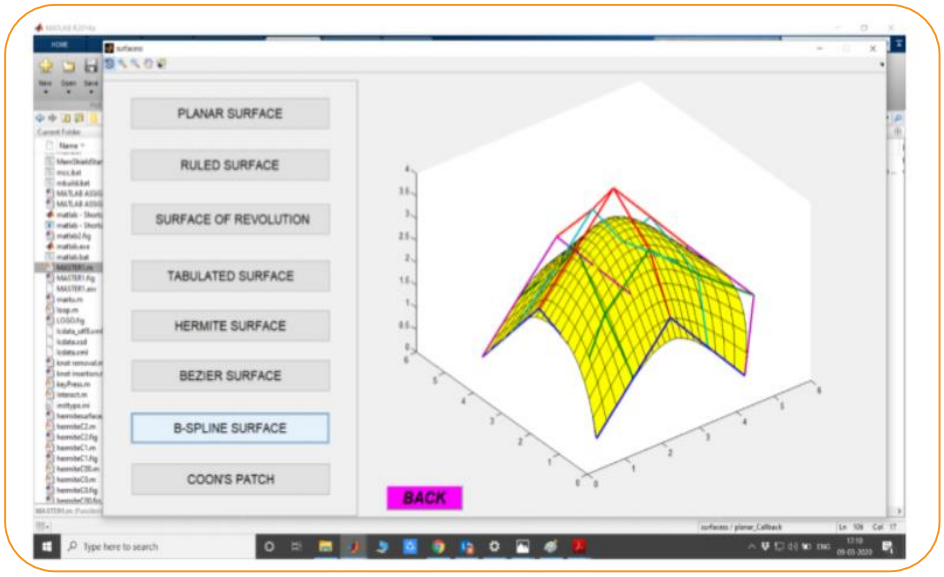
Developed prototype of the Diamagnetic Levitation using Bismuth and NdFeB magnets



Developed Low Cost 3D Printer



Compiler Design - Digital Lab Record with Program Codes and Results with explanation available Online



Teach CAD Software Simulation useful for the study and execution of 3-d surfaces

Instructional Design for Outcomes - Based Learning In Flipped Classroom Approach: A Case Study

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Abstract: This paper presents the instructional design for outcomes-based learning in flipped classroom approach for a topic, 'corrosion due to differential aeration cells' in the course, 'corrosion science', an open elective in undergraduate engineering program. The motivation phase and active learning phase as in-class activities and the information phase as the out of class activity are explained. The necessary videos as open education resources for the out of class activity are prepared by one of the authors and the links for these videos are given. The alignment of instructional strategies and assessment with the learning outcomes is also shown in this paper. Peer instruction, Think-Pair-Share and Team-Pair-Solo activities as the active learning strategies to enable the students achieve the higher order learning outcomes of the chosen topic are presented in detail. Flipped classroom approach has been shown to promote active learning and outcomes-based learning.

Keywords: flipped classroom, outcomes-based learning, undergraduate engineering education, think-pair-share, and team-pair-solo.

1. Introduction

India, having the highest population of the youth in the world (Sarah Boumphrey. 2012, State of world population 2014), is known to be a country of youth. According to the accord on 13th November 2014. NBA made it mandatory for the engineering colleges seeking accreditation by NBA to implement the outcome-based education (OBE). According to Spady (Spady, W.G. (1994)) "Outcome-based education (OBE) means focusing and organizing the entire educational programme and instructional efforts around the clearly defined outcomes, we want all students to demonstrate when they leave the institute". Boschee and Baron (Boschee, F and Baron M.A. (1993)), Tucker (Tucker (2004)) and Towers (Towers J.M. (1996)) defined Outcomes-Based Education. Though their expressions are different, they all opined that the primary focus of OBE is on the achievement of the stated learning outcomes of higher order by all the learners.

Active learning and student-centred learning are very important features of OBE. In this background an attempt has been made to develop the material and strategies for active learning and student-centred learning in flipped class room approach (Bishop, Jacob Lowell and Matthew A. Verleger. (2013), Jayakrishnan, M. (2016)) for a concept namely 'corrosion due to differential aeration cells' in the course, 'Corrosion Science', an open elective for the undergraduate engineering students. This paper is based on the experience of the authors and the open education resources developed for the out of class activity and the active learning strategies for the in-class activity in a flipped class room are presented in this paper.