

The Promise of Magnesium Technology in Engineering and Biomedical Applications in 21st Century and Beyond



NOVEMBER 21-25, 2023

INTERNATIONAL FACULTY

Dr. Manoj Gupta

Faculty of Mechanical Engineering, National University of Singapore

HOST FACULTY/COURSE COORDINATOR

Dr. Jagadeesha T, Associate Professor, Dept. of Mechanical Engg., NIT Calicut, Kerala, India

LOCAL COORDINATOR

Dr. N. Sandhyarani., Dean Research & Consultancy, NIT Calicut, Kerala, India.

OVERVIEW

In the 1st half of last century, magnesium was first introduced in the medical industry as an orthopaedic biomaterial. There are many characteristics and properties that make magnesium a very attractive option for use in implants and similar applications. Magnesium is also much more comparable to natural bone than other materials in regards to fracture toughness, elastic modulus and compressive yield strength. Not only does magnesium provide the mechanical and physical properties desirable in these applications, it also exhibits some special characteristics.

Magnesium is found naturally as an ion in the human body equating to about one mole in a 70kg person, half of which is stored within bone tissue. Magnesium within the body aids in metabolic reactions, has good biocompatibility, and is nontoxic. In addition, uncoated magnesium implants can be biodegradable in bodily fluids through corrosion which eliminates the need for a second surgery to remove implants. Application of protective coatings can prevent corrosion issues for applications in which a more permanent solution is needed. Research and testing of different alloys and formulas for protective finishes is currently in progress to increase the array of ways in which magnesium can be used in medical applications

Magnesium-based biomaterials are candidates to be used as new generation biodegradable metals. Mg can degrade during healing process, and if the degradation is controlled it would leave no debris after the completion of healing. Hence, the need for secondary surgical operation(s) for the implant removal could be eliminated. those of human bone

This GIAN course aims to give an overview about the Magnesium as biomaterial, and explain processing, characterisation, ultrahigh grained materials, additive manufacturing, strength, toughness, creep and corrosion-based design using Magnesium. It will provide a platform to discuss the current research activities across the globe in these areas.

OBJECTIVES

The primary objectives of the course are as follows:

- i) Exposing participants to the fundamentals of magnesium alloy as bio materials.
- ii) Design and property tailoring of magnesium alloys for automotive, aerospace and medical application
- iii) Property evaluation of magnesium and its fatigue, creep, fracture and biocompatibility analysis. Modelling and simulation of alloys under various test conditions.
- iv) Discuss the various innovative methods developed by the speakers to make bio compatible magnesium alloys.
- iv) Enhancing the capability of the participants to identify, control corrosion using bio compatible magnesium alloys under different conditions.
- v) Imparting design methodology used in developing smart structure and their practical applications in medical, engineering and bio tech field.

COURSE OVERVIEW

- Magnesium as bio material
- Processing of Magnesium
- Ultrafine grained materials and AM
- Design models
- Degradation of materials in human body
- Testing methods and strategies

Grade will be awarded based on the performance which will be assessed during the course

INTERNATIONAL FACULTY**Dr. Manoj Gupta**

Faculty of Mechanical Engineering

National University of Singapore

11 Lower Kent Ridge Drive, Singapore 119244

Dr Manoj Gupta was a former Head of Materials Division of the Mechanical Engineering Department and Director designate of Materials Science and Engineering Initiative at NUS, Singapore. He did his Ph.D. from University of California, Irvine, USA (1992), and postdoctoral research at University of Alberta, Canada (1992). He is currently among top 0.6% researchers as per Stanford' List, among Top 1% Scientist of the World Position by The Universal Scientific Education and Research Network and among 2.5% among scientists as per ResearchGate. To his credit are: (i) Disintegrated Melt Deposition technique and (ii) Hybrid Microwave Sintering technique, an energy efficient solid-state processing method to synthesize alloys/micro/nano-composites. He has published over 600 peer reviewed journal papers and owns two US patents and one Trade Secret. His current h-index is 73, RG index is 48.4 and citations are greater than 19000. He has also co-authored eight books, published by John Wiley, Springer and MRF - USA. He is Editor-in-chief/Editor of twelve international peer reviewed journals. A multiple award winner, he actively collaborate/visit Japan, France, Saudi Arabia, Qatar, China, USA and India as a visiting researcher, professor and chair professor.

WHO CAN ATTEND?

Students at all levels (B.Tech./M.Tech./Ph.D., in Mechanical/ Production Engineering and allied areas) Faculty from reputed academic institutions and technical institutions with aptitude for doing continuous research in these areas Executives, engineers & researchers from government organizations/ industries, including R&D organizations

ABOUT GIAN COURSE

Govt. of India approved a programme titled Global Initiative of Academic Networks (GIAN) in Higher Education aimed at tapping the talent pool of internationally renowned scientists and entrepreneurs. This is to encourage their engagement with the institutes of Higher Education in India so as to augment the country's existing academic resources, accelerate the pace of quality reform, and elevate India's scientific and technological capacity to global excellence; <http://www.gian.iitkgp.ac.in>

ABOUT NIT CALICUT

National Institute of Technology Calicut (NITC) is one of the 31 institutions of national importance governed by the NIT Act 2007 and is fully funded by the Government of India. Originally established in 1961 as a Regional Engineering College (REC), it was transformed into a National Institute of Technology in the year 2002.

The institute offers bachelors, masters and doctoral degree programmes in Engineering, Science, Technology and Management. With its proactive collaborations with a multitude of research organizations, academic institutions and industries, the institute has set a new style for its functioning under the NIT regime. The Institute is presently offering eleven UG programme and thirty PG programme along with Ph.D. programme in various fields of Engineering, Science Technology and Management; <http://www.nitc.ac.in>

ABOUT MECHANICAL ENGINEERING DEPARTMENT

Department of Mechanical Engineering, the largest department in the Institute, offers regular undergraduate, postgraduate and doctoral degree programmes. It also offers part time doctoral degree programmes, mainly meant for those employed in industries and academic institutions. Department offers continuing education programmes for industry and academic personnel. Summer/Winter schools have also been organised by the Department. The faculty of this department provides guest lecture for many of the neighbouring institutions. Besides teaching, the members of the faculty are involved in consultancy work (Design & Development, Energy Auditing, Industrial Sickness Evaluation, testing etc.), sponsored research work (sponsored by DST, AICTE, ARDB etc.), and product development. Vision of our department is to impart nationally and internationally recognised education in Mechanical Engineering, leading to well-qualified engineers who are innovative contributors to the profession and successful in advanced studies;

<https://nitc.ac.in/department/mechanical-engineering>

ADDRESS FOR CORRESPONDENCE

Dr. Jagadeesha T.

Coordinator

GIAN Course on the Promise of Magnesium technology in Engineering and Biomedical Applications in 21st Century and Beyond,

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National Institute of Technology Calicut,
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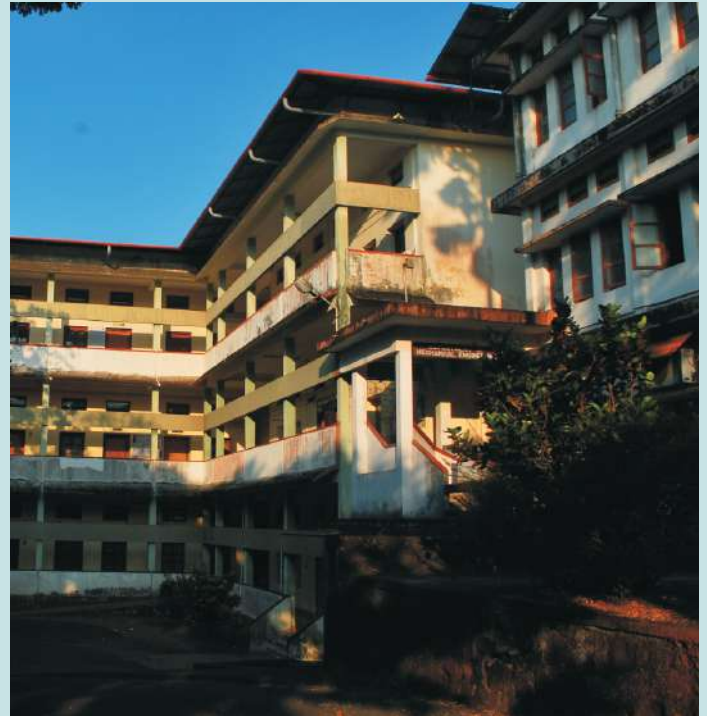
Email: jagdishg@nitc.ac.in

<https://nitc.ac.in/department/mechanical-engineering/faculty-and-staff/faculty>

REGISTRATION PROCESS

Step #1: Web Portal Registration: Visit GIAN Website at the link: <https://gian.iitkgp.ac.in/GREGN/index> and create login, User ID, and Password. Fill up the GIAN registration form and do web registration by paying Rs.500/- online through Net Banking/ Debit/ Credit Card as per instructions given there in. This provides the user with life time registration to enrol in any number of GIAN courses offered (Skip this step, if already registered with GIAN portal).

Step #2: Course Registration: Login to the GIAN portal again with the user ID and password already created in Step #1. Click on course registration option at the top of registration form. Select the course titled "The Promise of Magnesium technology in Engineering and Biomedical Applications in 21st Century and Beyond" from the list and click on the Save option. Confirm your registration by clicking on the Confirm Course option. The participant may then proceed for the course registration with the course coordinator by filling out the registration form.



Step #3: For provisional registration, scanned copies of the registration form should be sent to jagdishg@nitc.ac.in at the time of web portal registration.

Step #4: The duly filled up registration form and the DD/ NEFT/RTGS receipt must be sent to course coordinator on or before Nov 5, 2023 (form of Draft/NEFT/RTGS). The maximum number of participants of the program would be limited to 50.

MODE OF PAYMENT

Selected participants will be intimated through email. They have to remit the necessary course fee to the bank as per the details given below (inclusive of GST).

Participants from Abroad	: 80 USD
Participants from India	: 5000 INR
Industry/Research organisations	
Faculty from Academic Institutions	: 3000 INR
Research Scholars/Students (getting stipend)	: 1000 INR
Students (not getting stipend)	: 300 INR
Account Name	: DIRECTOR NIT CALICUT
Account No.	: 35909407299
Bank	: State Bank of India
Branch	: CREC, Chathamangalam Kozhikode-673601
BranchCode	: 002207
IFSC	: SBIN0002207
MICRCode	: 673002012
SWIFTCode	: SBINPNBB392

For any queries, please contact the coordinator. This course will be conducted **OFFLINE** as per MHRD Instructions.

IMPORTANT DATES

Last date for receiving application	Oct 25, 2023
Last date for intimation to participants by email	Oct 29, 2023
Last date for receiving registration form with Payment details	Nov 12, 2023
Course dates	Nov 21-25, 2023



GIAN Course on



GIAN
GLOBAL INITIATIVE OF ACADEMIC NETWORKS

The Promise of Magnesium Technology in Engineering and Biomedical Applications in 21st Century and Beyond

November, 21-25 2023

Department of Mechanical Engineering
National Institute of Technology Calicut, Kerala, India

Registration Form

Name: M F

Designation:

Highest Qualification & Specialization:

Programme and Semester: (students)

Organization:

Address:

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Mobile No: Email:

Your current research/ ongoing project

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Details of Payment of Registration Fee. *(No return of the payment, once it is made).*

DD No.....DateBank Amount.....

If paid through NEFT/RTGS

Transaction Number Date Bank

Accommodation Required: Yes/ No

Date

Signature of the Applicant.....

Please Send to:

Dr. Jagadeesha T
Coordinator

GIAN Course on the Promise of Magnesium
Technology in Engineering and Biomedical
Applications in 21st Century and Beyond

Department of Mechanical Engineering
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APPROVAL FROM AFFILIATED INSTITUTE OF THE APPLICANT

Certified that Mr./ Ms./ Dr.
is an employee/student of our institute. If selected, he/she will be permitted to
attend GIAN Course on **The Promise of Magnesium technology in Engineering and
Biomedical Applications in 21st Century and Beyond** conducted by NIT Calicut
during November ,21-25, 2023

Date:

Signature
and Seal of Approving Authority