

# Course on Tyre Technology

Basic & Advance



Basic Course : 7<sup>th</sup> Aug to 9<sup>th</sup> Aug 2023  
Advance Course : 10<sup>th</sup> Aug & 11<sup>th</sup> Aug 2023

Organised By



Indian Rubber Institute

Venue : Mysuru, Karnataka, INDIA

# About IRI

Indian Rubber Institute (IRI), is a professional body of rubber technologists, engineers, scientists, academicians and other professionals and organizations associated with the rubber and allied industry in India. A non-profit organization of 63 years standing, IRI was constituted as a national body and has since been continuing its educational and training activities through their eight branches spread across India in Chennai, Delhi, Gujarat, Karnataka, Kerala, Kolkata, Mumbai, and Rajasthan..

In order to substantially enhance the academic activity and to support rubber Industry, IRI has set-up Dr. D Banerjee Centre of Excellence in Mysuru, Karnataka in 10,000 sft area. The center is equipped with all types of facilities for training, education and testing of rubber products.

## The Course

The course is designed in two parts for the benefit of different experience and skill set required in the tyre Industry, Basic and Advance.

**Basic Course:** The course will guide you through different aspects of tyre technology that includes understanding of polymers, compound design, tyre design—cavity, pattern, construction, usage of FEA in Tyre, Tyre testing—Indoor and outdoor,

**Advance Course:** This course will take you through the advance characteristics of tyre technology which are vital for superior performance of tyres such as rubber fracture & friction, footprint, RRC, Force & Moment, NVH, Vehicle Dynamics, Tyre failure mechanism, World Tyre Regulations and sustainability & circular economy.

## For Whom

- Tyre Design Engineers
- Process Technologists
- R & D Engineers & Scientists
- Compound Developers
- Validation & Test Engineers
- Rubber & Polymer Technology Students
- Vehicle Test Engineers
- Vehicle Designers
- Tyre Raw Material technologists
- Vehicle Simulation Engineers

Visit to world class state-of-the-art tyre and rubber testing lab at the end of each program.



# Speakers

---

Dr. R Mukhopadhyay, (50Years), PhD ,  
Rubber Science and Tyre Technology

**Dr. R. Mukhopadhyay** is a well known speaker in international rubber and tyre industry. With over 50 years of experience in Education, Training and Research in Rubber Science and Tyre Technology, he is credited with more than 200 research and Technical Papers in National & International journals and seven Patents from his research work.

He is the Chairman of Indian Rubber Institute (IRI) and President of IRMRA., a Fellow Member of Indian National Academy of Engineers (FNAE), The Institution of Engineers India (FIE), American Chemical Society-Rubber Division, Member Board of Directors of Rubber, Chemical & Petrochemical Skill Development Council (RCPSDC), NSDC, Govt. of India.



Vitesh Kumar Giri (27 Years), B Tech, Ex PGP

Tyre Design



**Vitesh Kumar Giri** is a seasoned tyre professional having 27 years of experience in designing and developing tyres. He has a Bachelor degree in Mechanical Engineering from NIT JSR, a PG Diploma in Management from IIM Indore . Vitesh focuses his practice on Tyre Design and have designed and developed hundreds of tyres across the segment bias, radial. He is principal consultant with CRyT Innovation providing consultancy to tyre companies across the globe.

Dr. Samar Bandopadhyay, (32 Years), M. Tech PhD  
Rubber & Material Science

**Dr. Samar Bandopadhyay** is a well experienced rubber technologist with 30+ years of experience in rubber & tyre compounding, material selection and testing. He is Ph.D. in plastic & Rubber Technology. His experience expands across the rubber industries including tyre and other related products. He is visiting professor in various universities and is permanent faculty member of DIRI course conducted by IRI. He is fellow member of Institute of Engineers, Lead Assessors at NABL. He has 60 Technical papers and various book chapters to his credit.



Dr. Prasenjit Ghosh, (24 Years), M. Tech, PhD  
Rubber Technologist



**Dr. Prasenjit Ghosh**, has 22+ years of rich experience in the field of Finite Element Analysis of Automotive Products. Dr. Ghosh holds MTech. degree from IIT Kharagpur and Ph.D. degree from IIT Madras. He has spent his entire career in CAE software such as Simulia (Abaqus), Patran, Autocad and Hypermesh. He is seasoned speaker in national / international conferences. He is a Fellow Member (FIE) of Institution of Engineers (India), Member of Society of Automotive Engineers (SAE), India and Member of Indian Rubber Institute (MIRI). He has about 35 research publications in International Journals, Conferences and book chapter to his credit.

Amitabha Saha, (20 Years), B.Tech, NIT  
Finite Element Modelling

**Amitabha Saha**, was instrumental in creating India's first tyre simulation setup. He has more than two decades of experience using simulation technology, and has trained generations of simulation engineers. He is responsible for method developments like prediction of wear pattern, inclusion of tread pattern in simulation, curing simulation and the implementation of material models. He has more than 15 projects and more than 10 publications. His hobbies include maintaining a digital library.



## Pundarik Mahata (17 Years), ME , Vehicle Dynamics



**Pundarik Mahata** is a seasoned professional with 17+ years of rich experience in the design field of various Automotive Component. He has experience with leading automobile maker in the field of design, development and failure analysis on different driveline components. His work domain includes automobile system design, vehicle dynamics, studying contribution of components on vehicle dynamics, tyre technology, tyre mechanics. He has good knowhow on the simulation of components and MBD. Apart from coding in Python and Matlab,

## Srivatsan R (20 Years), B.E. (hons) Tyre Design

**R Srivatsan** is a New Product Development professional having experience in design and development of all product categories including bias and radials. He is graduate in Chemical Engineering from BITS, Pilani and have taken many certificate courses from reputed universities across the globe. Apart from tyres, he has product development knowledge on various automobile components as well. His experience varies in different aspects of product development that includes Product Planning, Development and Industrialization



## Dr. Barun Samui (30 Years), Ph.D. Textile Technology



**Dr. Barun Kumar Samui** has over 30 years of experience in various functions which include R&D, material development, new product development, Technical service and Quality system in the field of reinforcement technology. He has worked with leading fabric yarn makers like SRF. He is a textile graduate and earned an M.Tech in Fibre Science from IIT, Delhi. He did his PhD in Polymer Science from University of Calcutta and also did diploma in Rubber technology while working in the tyre industry. He is a visiting faculty for Indian Rubber Institute and a Fellow of the Institution of Engineers, India.

## Avinash Tomer (14 Years), BE Tech Mech , PGD Indoor and Outdoor Testing

**Avinash Tomer** is an experienced tyre professional having 14 years of experience in testing and validating tyres for NVH and Vehicle Dynamics characterization. involved in various projects for continuous expansion and establishment of current and new tyre testing capabilities . He has been actively involved in managing and conducting regulation tests for Wet Grip using both Skid Trailer & vehicle method and Coast by Noise as per ECE



## S Vasudev Rao, (40 Yrs) Dip. in Rubber Technology Manufacturing Technology



**Vasudev Rao** is a highly experienced professional in technology department in tyre industry. He is regular speaker on tyre manufacturing technology in various national and international forum. He is visiting faculty in various university as well as faculty on on IRI. He is member of many societies working in the field of tyre and rubber. He served as secretary– general of IRI administratively and as faculty, academically.

# Course Content ... Basic

---

## Session 1 Elastomer for Tyre Industry

Rubber, a versatile material

Natural Rubber

Synthetic Rubber- BR, SBR, IIR, XIIR, EPDM

Understanding the characteristics, its usage and application in tyre

---

## Session 2 Rubber Materials

Fillers — carbon black & other modern discoveries

Additives... vulcanizing agents,

accelerators, retarders, activators, Processing Aids, Bonding Agents, & Protective Agents...

Understanding their role in rubber characteristics enhancement and their roles in different types of tyre applications.

---

## Session 3 Reinforcing Material

Organic Tyre Cords – Nylon, Polyester, Rayon, Aramid...

properties, application & selection of cord.

Inorganic Tyre Cord - Steel & Bead Wire

---

## Session 4 Rubber Compounding Technology

Rubber compound design based on tyre types, application etc.

Commercial Tyre – Radial & Bias

Passenger Tyre – Radial

Off Highway Tyre—Earth movers, Agriculture, Industrial, Solid Tyres

2/3-Wheeler Tyre

Tubes / Flaps

---

## Session 5 Tyre Design—Contour

Fixing up major Dimensions

How to design Tyre Contour

Natural Equilibrium Theory and further improvisation

Cord Path

Load Capacity Calculation

A case study with practical cavity development

---

## Session 6 Tyre Design—Pattern

SAE system for Force and Moment

Tyre Pattern Types for Different Applications

A Practical Approach to Design Patterns

Design for Noise, Aquaplaning

# Continued...

---

**Session 7**      **Tyre Design—Structure**  
Cured Tyre Layout design, Carcass, Bead strength & Safety Factor  
Conversion of CTL to green components like Tread / Sidewall  
Green angle calculation for plies and belts

---

**Session 8**      **Tyre Design—Computational Methodology**  
Introduction to FEM in tyre  
Use of CAE in tyre design  
Stiffness, Footprint, Stress – Strain, Cure simulation, Hydroplaning,  
Rolling resistance, temperature prediction  
Noise Analysis

---

**Session 9**      **Tyre Manufacturing Technology - Upstream**  
  
Understanding upstream equipment, their process technology & Quality Control  
Mixing Technology  
Extrusion Process  
Calendaring

---

**Session 10**     **Tyre Manufacturing Technology - Downstream**  
Tyre Building – Bias & Radial  
Tyre Curing/ vulcanization & heat engineering

---

**Session 11**    **Tyre Testing - Indoor and Outdoor**  
Test Machines for Tyre Characteristics measurement  
Dimension, Footprint, Stiffness  
Load & Speed Endurance, Plunger,  
Rolling Resistance  
Force & Moment  
Vehicle dynamics testing – subjective & objective  
NVH Testing

---

**Session 12**    **Technical Lab Visit**  
Visit to test lab to witness state of the art modern rubber and tyre testing equipment and their practical usage.

# Course Content—Advance

## Session 1 Rubber—Friction, Fraction & Wear

Rubber Friction Mechanism and its influence on tyre performance (dry & wet braking).  
Rubber fracture mechanism and its influence on tyre performance.  
Wear mechanism and influencing factors.

## Session 2 Tyre Characteristics—Footprint, RRC and F&M

Footprint mechanics – static, rolling, cambered and slip angle condition  
Fundamentals of Rolling resistance, Factors influencing rolling resistance (design, material, construction, process, operational), Rolling resistance and vehicle fuel economy  
Fundamentals of tyre Force & Moment—Lateral & Longitudinal dynamics, Vehicle handling performance

## Session 3 Tyre Characteristics—NVH

Tyre Noise Generation Mechanism, Tyre Noise & Vibration Measurement  
Tyre Modal Analysis – FRF, Mode shapes etc., Factors Influencing Tyre NVH

## Session 4 Tyre models and vehicle dynamics simulation

Overview of Fiala, Magic Formula and F-Tire Model, Comparison of the above models w.r.t advantages and disadvantages.  
Magic Formula – Experiment and parameter extraction  
Vehicle Dynamics Simulation using Magic Formula coefficients and generic vehicle model

## Session 5 Mechanics of tyre failure

Mechanics of Tyre failure & Major tyre failures in field  
Mechanics of tyre wear & vehicle factors that influences it

## Session 6 Global Tyre Regulations

New global Tyre standard... under consideration  
Requirements of REACH, DoT – NHATSA, EU ... ECE, Gulf, BIS regulations  
Other important international regulations

## Session 7 Sustainability & Circular Economy

Recent trend in use of non-petro based eco friendly & sustainable material .  
Circular Economy & 4R strategy (Re-use, Recycle, Regenerate and Renewable) in tyre industry  
Legislations & Regulations with respect to End-of-life (ELT) tyres and Extended Producer Responsibility (EPR)

## Session 8 Technical Lab Visit

Visit to test lab to witness state of the art modern rubber and tyre testing equipment and their practical usage.

## Investment (Per Delegate)

---

Basic Course (3 Days) : INR 29,999/-

Advance Course (2 Days) : INR 24,999/-

Combined (Basic + Advance) (5 Days) : INR 49,999/-

- 18% GST Extra
- 5% Discount on nomination of 4 delegates from same organization
- 25% flat discount to Students and IRI life members (Students must be presently enrolled in full time in an accredited Institute/ university and IRI life membership must be prior to March 2023.
- Course fee includes Certificate, Study Material , Lecture Hall, Lunch , Tea & Snacks
- Fee is non-refundable / Non- Adjustable, however change in nomination can be accepted

## About Venue—Mysuru

---

Mysuru is a beautiful city in southern Karnataka, 200 kms from Bengaluru. It is famous for Chamundeshwari Devi Temple, Mysore Palace, silk, sandalwood and spices. Mysore is one of the leading tourist place in India and gateway to hill stations such as Ooty & Coorg.

To Register, please visit [www.iri.net.in](http://www.iri.net.in) or write to [iri-dbcoe@crytmail.com](mailto:iri-dbcoe@crytmail.com).

For accommodation, please write separate mail to [iri-dbcoe@crytmail.com](mailto:iri-dbcoe@crytmail.com). We have corporate tie-up with many leading hotels in the city in different budget.

International delegates can approach us for assistance in Visa requirements.

Program Director —DR. R Mukhopadhyay, Chairman (IRI)

Program Co-Ordinator —Vitesh Kumar Giri, Principal Consultant , CRyT Innova-

## INDIAN RUBBER INSTITUTE

Dr D Banerjee Centre of Excellence  
JSS Technical Institution Campus,  
Mysuru– Karnataka, INDIA 570 006

---

[www.iri.net.in](http://www.iri.net.in)

Phone : +91 9902324101

E-mail: [iri-dbcoe@crytmail.com](mailto:iri-dbcoe@crytmail.com)

---