



### List of New Course(s) Introduced

**Department** : **Industrial and Production Engineering**

**Programme Name** : **B.Tech.**

**Academic Year** : **2020-21**

### **List of New Course(s) Introduced**

Sr. No.	Course Code	Name of the Course
01.	IP03TES05	Engineering Thermodynamic
02.	IP03PBS03	Programing In C & MATLAB
03.	IP04PPC03	Modelling Software Lab
04.	IP04THS023	Energy And Environment Management
05.	IP05TPE13	Employee Relation



## Minutes of Meetings (MoM) of Board of Studies (BoS)

**Academic Year : 2020-21**

**School : School of Studies of Engineering and Technology**

**Department : Industrial and Production Engineering**

**Date and Time : August 14, 2020 - 12:00 PM**

**Venue : CAD Lab G10**

The scheduled meeting of member of Board of Studies (BoS) of Department of Industrial and Production Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Third year (III and IV semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. G.K. Agrawal (External Expert Member BoS, Professor, GEC Bilaspur)
2. Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.)
3. Prof. Mukesh Kumar Singh (Member BoS, Professor, Dept. of Industrial and Production Engineering)
4. Mrs. Arpita Roy Choudhary (HOD, Assistant Prof., Dept. of Industrial and Production Engineering-cum Chairman, BOS)
5. Mr. C.P. Dewangan (Member BoS, Associate Professor, Dept. of Industrial and Production Engineering)
6. Mrs. Disha Dewangan (Member BoS, Assistant Professor, Dept. of Industrial and Production Engineering)
7. Prof. S.C. Srivastava (Invited Member, Professor, Dept. of Industrial and Production Engineering)
8. Mr. Nitin Kumar Sahu (Invited Member, Assistant Professor, Dept. of Industrial and Production Engineering)
9. Mr. Kailas Kumar Borkar (Invited Member, Assistant Professor, Dept. of Industrial and Production Engineering).

Prof. G.K. Agrawal (External Expert Member BoS, Professor, GEC Bilaspur) and Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.) , has attended the online meeting and they have given their consent via mail.

Following points were discussed during the meeting

1. In the meeting, Choice Based Credit System(CBCS) scheme and syllabus of B.Tech III and IV semester (Industrial and Production Engineering) were discussed in details. All suggestion of the members are incorporated and modified and then recommended for approval.
2. The CBCS scheme and syllabus of B.Tech (Industrial and Production Engineering) III,IV semester have been accepted by the BOS (I.P.E.)

**The following new courses were introduced in the of B. Tech. Final year (III and IV Semesters):**

- ❖ Engineering Thermodynamic (IP03TES05)

**गुरु घासीदास विश्वविद्यालय**  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)  
**कोनी, बिलासपुर - 495009 (छ.ग.)**



**Guru Ghasidas Vishwavidyalaya**  
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)  
**Koni, Bilaspur - 495009 (C.G.)**

- ❖ Programming in C & MATLAB (IP03PBS03)
- ❖ Modelling Software (IP04PPC03)
- ❖ Energy and Environment Management (IP04THS023)

**विभागाध्यक्ष / Head**  
**औद्योगिक एवं उत्पादन अभियांत्रिकी**  
Industrial & Production Engineering  
प्रौद्योगिकी संस्थान / Engineering & Technology  
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)  
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD



## Minutes of Meetings (MoM) of Board of Studies (BoS)

**Academic Year : 2020-21**

**School : School of Studies of Engineering and Technology**

**Department : Industrial and Production Engineering**

**Date and Time : July 27, 2020 - 12:00 PM**

**Venue : CAD Lab G10**

The scheduled meeting of member of Board of Studies (BoS) of Department of Industrial and Production Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Third year (V and VI semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. G.K. Agrawal (External Expert Member BoS, Professor, GEC Bilaspur)
2. Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.)
3. Prof. Mukesh Kumar Singh (Member BoS, Professor, Dept. of Industrial and Production Engineering)
4. Mrs. Arpita Roy Choudhary (HOD, Assistant Prof., Dept. of Industrial and Production Engineering-cum Chairman, BOS)
5. Mr. C.P. Dewangan (Member BoS, Associate Professor, Dept. of Industrial and Production Engineering)
6. Mrs. Disha Dewangan (Member BoS, Assistant Professor, Dept. of Industrial and Production Engineering)
7. Prof. S.C. Srivastava (Invited Member, Professor, Dept. of Industrial and Production Engineering)
8. Mr. Nitin Kumar Sahu (Invited Member, Assistant Professor, Dept. of Industrial and Production Engineering)
9. Mr. Kailas Kumar Borkar (Invited Member, Assistant Professor, Dept. of Industrial and Production Engineering).
10. Mr. Leeladhar Rajput (Invited Member, Assistant Professor, Dept. of Industrial and Production Engineering).

One external member Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.), was unable to attend online meeting but he has given his consent via mail.

Following points were discussed during the meeting

3. In the meeting, Choice Based Credit System(CBCS) scheme and syllabus of B.Tech V and VI semester (Industrial and Production Engineering) were discussed in details. All suggestion of the members are incorporated and modified and then recommended for approval.
4. The CBCS scheme and syllabus of B.Tech (Industrial and Production Engineering) V and VI semester have been accepted by the BOS (I.P.E.)

**The following new courses were introduced in the of B. Tech. Final year (V and VI Semesters):**

**गुरु घासीदास विश्वविद्यालय**  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)  
**कोनी, बिलासपुर - 495009 (छ.ग.)**



**Guru Ghasidas Vishwavidyalaya**  
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)  
**Koni, Bilaspur - 495009 (C.G.)**

❖ Employee Relation (IP05TPE13)

**विभागाध्यक्ष/Head**  
**औद्योगिक एवं उत्पादन अभियांत्रिकी**  
Industrial & Production Engineering  
प्रौद्योगिकी संस्थान/Engineering & Technology  
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)  
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD



## Scheme and Syllabus

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

**GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG  
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY**

**Department of Industrial & Production Engineering**

**CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2020-21**

**B.TECH SECOND YEAR, III SEMESTER**

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP03TBS05	Numerical Methods	3	-	-	30	70	100	3
2.	IP03TES05	Engineering Thermodynamic	3	1	-	30	70	100	4
3.	IP03TPC01	Strength of Material	3	1	-	30	70	100	4
4.	IP03TPC02	Theory of Machines	3	1	-	30	70	100	4
5.	IP03TPC03	Manufacturing Processes-I	3	-	-	30	70	100	3
<b>Total</b>			<b>15</b>	<b>3</b>	<b>-</b>	<b>150</b>	<b>350</b>	<b>500</b>	<b>18</b>
<b>PRACTICALS</b>									
1.	IP03PPC01	Theory of Machines Lab	-	-	2	30	20	50	1
2.	IP03PPC02	Material Testing Lab	-	-	2	30	20	50	1
3.	IP03PBS03	Programing in C & MATLAB	-	-	2	30	20	50	1
<b>Total</b>			<b>-</b>	<b>-</b>	<b>6</b>	<b>90</b>	<b>60</b>	<b>150</b>	<b>3</b>

Total Credits: **21**

Total Contact Hour: **24**

Total Marks: **650**

INTERNAL ASSESSMENT:-two class tests of 15 marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION





DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-1	CT-2			
B. Tech III Sem.	IPC3TES05	Engineering Thermodynamic	3	1	-	15	15	70	100	4

**COURSE OBJECTIVES:**

1. This course deals with the fundamentals of thermodynamics including thermodynamic systems, properties, and relationships among the thermos-physical properties, the laws of thermodynamics and applications of these basic laws in thermodynamic systems.
2. To enable the students to understand second law of thermodynamics and apply it to various systems, note the significance of the results and to know about entropy and second law aspects of daily life.
3. To enable the students about properties of pure substances and to analyse vapour power cycle.

**COURSE OUTCOMES:**

After completion of the course, the students will be able to:

CO1: Apply principles of engineering, basic science, and mathematics (including multi variant calculus and differential equations) and thermodynamics to model, analyse, design, and realize physical systems, components, or processes.

CO2: Identify, formulate, and solve engineering problems.

CO3: Apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.

CO4: omprehend the thermodynamics and their corresponding processes that influence the behaviour and response of structural components.

**COURSE CONTENT:**

**Module – I**

**Basic concepts:** Concept of continuum, macroscopic and microscopic approach.

**Thermodynamic systems:** Closed, open and isolated system, property, state, path and point function, process, quasi static process, work, modes of work transfer, Zeroth law of thermodynamics, concept of temperature and heat, concept of ideal and real.

**First law of thermodynamics:** Concepts of internal energy, specific heat capacities, enthalpy, energy balance for closed and open systems, energy balance for steady flow systems, steady and unsteady flow energy equation and its applications.



**Module – II**

**Second law of thermodynamics:** Thermal energy reservoirs, second law, Carnot cycle, Carnot theorem, thermodynamic temperature scale, Carnot heat engine, refrigerator and heat pump, Clausius inequality, concept of entropy, principle of entropy, reversible and irreversible processes, entropy change during process, available and un-available energy, availability for closed and open system, Third law of thermodynamics.

**Module – III**

**Properties of pure substances:** Thermodynamic properties of pure substances in solid, liquid and vapour phases. Phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam, calculations of work done and heat transfer in non-flow and flow processes.

**Module – IV**

**Vapour power cycles:** Carnot cycle, Rankine cycle, Reheat cycle, Regenerative cycle, Binary vapour cycle, thermal efficiency and work ratios, factors affecting efficiency and work output.

**Module – V**

**Heat Transfer:** Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzmann's law, combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient. Basic concept of convection and its application. Thermal Radiation: black and non black bodies, Kirchhoff's law, intensity of radiation, radiation exchange between black surface, geometric configuration factors.

**TEXT & REFERENCE BOOKS:**

1. Engineering Thermodynamics – P.K. Nag, Tata McGraw Hill Education.
2. Thermodynamics – An Engineering Approach – Cengel, McGraw Hill Education.
3. Fundamentals of thermodynamics – Sonntag & G. J. V. Wylen, John Wiley and Sons.
4. Fundamentals of Engineering Thermodynamics – M. J. Moran, H. N. Shapiro, D. D. Boettner & M. Bailey, John Wiley & Sons.
5. Engineering thermodynamics – J. B. Jones & R. E. Dugan, Prentice Hall.
6. Outline of Thermodynamics for Engineers – M. C. Potter & C. W. Schaum's Somerton, McGraw-Hill Education.





DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B.Tech III Sem.	IP03PBS03	Programming in C & MATLAB	-	-	2	30	20	50	1

**COURSE OBJECTIVES:**

1. To familiarize the student in introducing and exploring MATLAB & C softwares.
2. To enable the student on how to approach for solving engineering problems using simulation tools.
3. To prepare the students to use MATLAB/C in their project works.
4. To provide a foundation in use of this softwares for real time applications

**COURSE OUTCOMES:**

After completion of the course, the students will be able to

- CO1: Perform the programming & simulation for engineering problems.  
 CO2: Learn importance of this software for lab experimentation.  
 CO3: Articulate importance of software's in research by simulation work.  
 CO4: In-depth knowledge of providing virtual instruments on C language environment.  
 CO5: Ability to write basic mathematical, numerical method problems in MATLAB.

**LIST OF EXPERIMENT:**

1. Write a programme which creates and uses array of object of a class (for example implementing the list of student of their department having details such as name, age etc).
2. Write a programme to find maximum out of two numbers.
3. Write a programme using copy constructor to copy data of an object to another object.
4. Write a programme to over load new/delete operators in a class.
5. Write a programme to illustrate the use of pointers two object which are related by inheritance.
6. Write a programme showing data conversion between objects of different classes.
7. Write a programme to show conversion from string to integer and vice versa.
8. To know the history and features of MATLAB & the local environment of MATLAB.
9. Find the roots of equations find the values at different points and plot the graph.
10. Find the derivative of an equation in MATLAB.
11. Find the area enclosed between the curves in MATLAB.
12. Find the addition, subtraction, multiplication, transpose and inverse of matrices.
13. Find the rank: Eigen values and Eigen vector of matrices.
14. Write a program to find the roots of an equation using Bi-section method, Regula-falsi method and Newton Raphson method.
15. Plot the surface for an equation.



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SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY**

**Department of Industrial & Production Engineering**

**CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2020-21**

**B.TECH SECOND YEAR, IV SEMESTER**

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP04TBS06	Statistical Methods	3	-	-	30	70	100	3
2.	IP03TPC04	Marketing Management	3	-	-	30	70	100	3
3.	IP04TPC05	Material Science	3	-	-	30	70	100	3
4.	IP04TPC06	Fluid Mechanics	3	1	-	30	70	100	4
5.	IP04TPC07	Manufacturing Processes-II	3	-	-	30	70	100	3
6.	IP04THS02	Electives From Humanity Science-02	3	-	-	30	70	100	3
<b>Total</b>			<b>18</b>	<b>1</b>	<b>-</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>19</b>
<b>PRACTICALS</b>									
1.	IP04PPC03	Modelling Software Lab	-	-	2	30	20	50	1
2.	IP04PPC04	Fluid Mechanics Lab	-	-	2	30	20	50	1
<b>Total</b>			<b>-</b>	<b>-</b>	<b>4</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>2</b>

Total Credits: **21**

Total Contact Hour: **23**

Total Marks: **700**

INTERNAL ASSESSMENT:-two class tests of 15 marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

Electives From Humanity Science-02	
IP04THS021	Business Communication and Presentation Skill
IP04THS022	Occupational Health and Safety
IP04THS023	Energy and Environment Management



DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-1	CT-2			
B.TechIV Sem.	IP04THS023	Energy and Environment Management	3	-	-	15	15	70	100	3

**COURSE OBJECTIVES:**

- To achieve and maintain optimum energy procurement and utilization throughout the organization and to minimize energy costs/waste without affecting production and quality. To minimize environmental effects.

**COURSE OUTCOMES:**

After completion of the course, the students will be able to

CO1: Develop their understanding of the technologies involved in energy production and their importance to climate change in relation to energy policies.

CO2: Analyse the roles of renewable energy systems such as wind, wave, tidal, solar and biofuels.

**COURSE CONTENT:**

**Module – I**

**Basic concepts of energy:** Theoretical treatment of energy, laws of thermodynamics, Carnot efficiency, energy quality and energy budget. Energy balance of earth: sunlight electromagnetic spectrum, major flows in global hydrological cycle, ocean currents and heat flux, atmospheric circulation, earth's energy budget.

**Module – II**

**Energy resources:** Non-renewable energy resources, fossil fuels origin, development of coal fired power plants, cleaner coal combustion, origin and reserves of petroleum and natural gas, composition and classification of petroleum, petroleum refining. Environmental problems associated with petroleum.

**Module – III**

**Renewable energy resources:** New developing renewable energy sources, nuclear fission reactors, fission power and the environment, Solar energy – collection and storage – present scenario in India, Wind energy and management, Tidal energy and management, Geothermal energy, Bio-gas plants and energy management.

**Module – IV**

**Importance of management of energy sources:** Management of fossil fuel sources, oil crisis and economic development, OPEC Market behaviour, management of oil and natural gas, extraction and processing, management strategies of renewable energy sources.



DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B.TechIV Sem.	IP04PPC03	Modelling Software Lab	-	-	3	30	20	50	1

**COURSE OBJECTIVES:**

- To establish the scientific and regulatory basis of graphical representation in the general context of Industrial Engineering, as a means of expression and communication for the design, creation.
- Development of an industrial installation and/or product making practical use of the current technological means available, consistent with the scientific teaching framework and in response to technological evolution.

**COURSE OUTCOMES:**

After completion of the course, the students will be able to

- CO1: Use their capacity of vision to interpret and/or convey the technical information in an industrial drawing.
- CO2: Know and apply graphical representation techniques using traditional metric geometry and descriptive geometry methods.
- CO3: Know, identify, interpret and apply the current standards on Industrial Technical Drawing. Computer aided design applications that allow students to elaborate and use graphical and technical information.

**LIST OF EXPERIMENTS:**

- Introduction to CAD (layout and sketching, elements of drawing, draw commands).
- Understanding the 3D function / tool bars in CAD software.
- How to draw sketch for 3D modelling.
- 3D modelling of different components using CAD software.
- Drawings of different components using CAD software.
- Surface modelling of different mechanical components in CAD software.
- Presenting different orthographic/isometric views of 3D models in CAD.
- Assembly of different mechanical component.





DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

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SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY**

Department of Industrial & Production Engineering

**CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2020-21**

**B.TECH. THIRD YEAR, V SEMESTER**

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP05TPC08	Design of Machine Elements	3	1	-	30	70	100	4
2.	IP05TPC09	Metal Cutting	3	0	-	30	70	100	3
3.	IP05TPC10	Statistical Quality Control	3	0	-	30	70	100	3
4.	IP05TPE01	Professional Electives-01	3	0	-	30	70	100	3
5.	IP05TPE02	Professional Electives-02	3	0	-	30	70	100	3
6.	IP05THS04	Electives from Humanity Science-03	3	0	-	30	70	100	3
<b>Total</b>			<b>18</b>	<b>1</b>	<b>-</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>19</b>
<b>PRACTICALS</b>									
1.	IP05PPC05	Metal Cutting Lab	-	-	2	30	20	50	1
2.	IP05PSC01	Seminar	-	-	2	50	-	50	1
<b>Total</b>			<b>-</b>	<b>-</b>	<b>4</b>	<b>80</b>	<b>20</b>	<b>100</b>	<b>2</b>

Total Credits: **21**

Total Contact Hour: **23**

Total Marks: **700**

INTERNAL ASSESSMENT: - Two class tests of 15 marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

IP05TPE01 Professional Electives-01
IP05TPE11 Industrial Engineering
IP05TPE12 Work Study and Ergonomics
IP05TPE13 Employee Relation
IP05TPE02 Professional Electives-02
IP05TPE21 MEMS & Nanotechnology
IP05TPE22 I. C. Engine
IP05TPE23 Mechatronics
IP05THS04 Electives from Humanity Science-03
IP05THS41 Financial Management
IP05THS42 Managerial Economics
IP05THS43 Financial Accounting and Costing



DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech. V Sem.	IP05TPE13	Employee Relations	3	-	-	15	15	70	100	3

**COURSE OBJECTIVES:**

1. To develop the knowledge on trade unions and its formation, structure, functions and legal framework.
2. To gain insight into the process of collective bargaining, its origin and development.
3. To describe the activities, include annual employee reviews and the on-going development of employees through training and managerial guidance.

**COURSE OUTCOMES:**

After completion of the course, student will be able to

CO1: Ability to describe and critique the concept of employee engagement.

CO2: Ability to identify problems associated with both over-engagement and disengagement.

CO3: Ability to examine the extent to which emotional and aesthetic labour are positioned in some contemporary organizations.

CO4: Ability to critically evaluate the measurement of employee engagement.

CO5: Ability to align organizational and employee objectives for improved organizational effectiveness.

**Module - I**

**Conceptual framework of employment relations:** Concept, scope and approaches to industrial relations, evolution of industrial relations and current developments, constitutional and legal framework of industrial relations: conventions, id act, trade union act.

**Module - II**

**Trade unionism:** Trade union development and functions, trade union structure and recognition, managing trade unions, managerial unionism, employers' organisations.

**Module - III**

**Collective bargaining:** Nature and content of collective bargaining, negotiation skills, issues and trends in collective bargaining.

**Module - IV**

**Employee involvement:** Evolution, structure and process, design and dynamics of participative forums, strategies for implementing participation.