RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*1*	*1*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Explain the function of coherent light source
LO Description	Introduce Coherent Light Source (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-01	Meaning of LASER Review of Optical spectrum, energy, power, intensity of light Energy levels Population inversion	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-01	Internal- Assignment Progressive	**Student will be asked to** (and/or): 1. Write full form of Laser. 2. Write range of Optical Spectrum. 3. Define Optical Energy, Power and Intensity. 4. Explain Energy levels of atoms and molecules. 5. Define and Explain Population Inversion.	10	Question paper, Rating scale	Internal-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				1	2	

COURSE NAME	**Laser, Application and Safety**
CO Description	Explain the function of coherent light source
LO Description	Explain working of Laser (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-02	- Basic components of Laser: Active medium, Pump and Resonator - Basic Principle of Laser - Radiative processes: Absorption, Spontaneous and stimulated emission - Pumping methods: Optical and Electrical discharge pumping	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	10	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-02	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Draw Basis diagram of a Laser showing basic components. 2. Explain Principle of Laser. 3. Explain three radiative processes. 4. Explain the need of pumping in Laser system. 5. Draw and explain Optical and Electrical discharge pumping method.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*1*	*3*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Explain the function of coherent light source
LO Description	Describe properties of Laser Radiation (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-03	Meaning and specific use of the followings: - Divergence - Coherence - Monochromaticity and spectral width - Intensity - Focusing of Laser beam	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-03	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Explain four Properties of Laser radiation. 2. Define coherence of Laser. 3. Distinguish between Laser and Ordinary Light source. 4. Table properties of Laser and corresponding applications. 5. Explain advantages of focusing of Laser beam.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				1	4	

COURSE NAME	**Laser, Application and Safety**
CO Description	**Explain the function of coherent light source**
LO Description	**Know general specifications of Laser(Cognitive)**

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-04	- Distinguish between CW and pulsed LASER - List general Optical specifications of Laser System - List general Electrical specifications of Laser System - Need of Cooling system	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-04	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Differentiate between CW and Pulsed Laser. 2. Write three advantages of Pulsed Laser. 3. Name three Optical specifications of Laser. 4. Write three Electrical specifications of Laser system. 5. Explain need of cooling system in a Laser.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				2	5	

COURSE NAME	**Laser, Application and Safety**
CO Description	Demonstrate different Laser systems
LO Description	Demonstrate Popular Gas Lasers (Psychomotor)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-05	Classification of Laser based on active medium: - Solid state Laser, Gas Laser, Liquid Laser, Semiconductor Laser Operation, performance characteristics and specific application of: - He-Ne Laser - CO_2 Laser Compare CO2 Laser and He-Ne Laser Beam divergence measurement of HeNe/Semiconductor Laser	Lab demonstration, hands on practice, Lab assignments	● Teacher will explain the content in class/lab. ● Teacher with support from lab staff will demonstrate the procedure of lab experiments. ● Student will conduct lab assignment based on these experiments.	-	9	HeNe Laser with Power supply, CO2 Laser system, Power meter, Optical bench with mounts, Polarizer, Safety goggles, Lab manual	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-05	Practical test in laboratory	**Student will be asked to** (and/or): 1. Write name of three gas Lasers. 2. Classify Laser on the basis of active medium. 3. Distinguish between HeNe Laser and CO2 Laser. 4. Explain Laser beam divergence measurement method. 5. Give typical beam divergence of HeNe and Semiconductor Laser.	15	Rubrics, Rating Scale	External-Practical

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				2	6	

COURSE NAME	**Laser, Application and Safety**
CO Description	Demonstrate different Laser systems
LO Description	Demonstrate Popular high power Lasers (Psychomotor)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-06	Operation, performance characteristics and specific application of: - Nd: YAG Laser - Fiber Laser Compare Nd:YAG Laser and Fiber Laser	Lab demonstration, hands on practice, Lab assignments	● Teacher will explain the content in class/lab. ● Teacher with support from lab staff will demonstrate the procedure of lab experiments. ● Student will conduct lab assignment based on these experiments.	-	7	Nd:YAG Laser with Power supply, Fiber Laser Laser system, Power meter, Optical bench with mounts, Safety goggles, Lab manual	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-06	Practical test in laboratory	**Student will be asked to**(and/or): 1. Write advantage of Fiber Laser for material processing. 2. List applications of Nd:YAG Laser. 3. List applications of Fiber Laser. 4. Compare Nd:YAG and Fiber Laser for Cutting. 5. List three specifications of Fiber Laser.	10	Rubrics, Rating Scale	Internal-Practical

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				2	7	

COURSE NAME	**Laser, Application and Safety**
CO Description	Demonstrate different Laser systems
LO Description	Describe the working of Semiconductor Laser (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-07	Semiconductor (Diode) Laser: - Materials, Band gap and Wavelength - Structure - Basic Principle and Pumping Method - Advantages of Semiconductor Laser - List Various Applications of Semiconductor Laser	Interactive classroom lecture, PPT, demonstration , quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-07	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Explain working of Semiconductor Laser. 2. List three semiconductors with bandgaps to make diode Laser. 3. Compare HeNe Laser with Semiconductor Laser. 4. Write three advantages of Diode Laser. 5. Explain use of Semiconductor Laser for remote sensing applications.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*3*	*8*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Use of high power Laser for various Industrial applications
LO Description	Describe Material Processing Applications (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-08	- Advantages, compare with Conventional methods - Lasers choice and comparison for Material processing - Beam transport mechanism (Typical Setup) - List Various Material Processing Applications	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-08	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Write five advantages of Laser Material Processing. 2. Compare CO2 and Nd:YAG Laser for cutting. 3. Draw Laser beam transport mechanism. 4. List basic material processing applications. 5. Explain suitability of Lasers for cutting among Nd:YAG, CO2 and Fiber Lasers.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*3*	*9*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Use of high power Laser for various Industrial applications
LO Description	Explain Laser Cutting of Metals and Non-Metals (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-09	Laser Cutting methods: - Melt and Blow Method - Vaporization cutting - Scribing	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Numerical Problems Workbook Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-09	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Draw a diagram to explain melt and Blow Laser cutting. 2. Describe role of shield Gas in metal cutting. 3. Explain Vaporization Laser cutting. 4. Give example of scribing cutting method. 5. Write factors on which cutting speed depends.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				3	10	

COURSE NAME	**Laser, Application and Safety**
CO Description	Use of high power Laser for various Industrial applications
LO Description	Describe other Industrial Applications (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-10	- Laser Welding - Laser engraving - Laser Surface hardening	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	--	Text Books, PPT, Handouts, chalk board, Video lecture- NPTEL and others	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-10	Internal – Assignment & / Progressive	**Student will be asked to** (and/or): 1. Compare CW and Pulsed Laser for Welding**.** 2. Write five advantages of Laser Welding. 3. Draw setup for Laser engraving. 4. Explain phase transformation surface hardening of Carbon steel. 5. Explain advantages of Laser surface hardening.	10	Question paper, Rating scale	Internal-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*4*	*11*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Use of Lasers for various services of human being
LO Description	Use Laser for metrological applications (Psychomotor)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-11	Metrology Applications: - Optical alignment - Distance measurement - Diameter measurement - Holography	Lab demonstration, hands on practice, Lab assignments	● Teacher will explain the content in class/lab. ● Teacher with support from lab staff will demonstrate the procedure of lab experiments. ● Student will conduct lab assignment based on these experiments.	-	9	HeNe Laser, Power meter, Optical bench with mounts, Lenses and holders, Hologram, Lab manual	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-11	Practical test in laboratory	**Student will be asked to** (and/or): 1. List five metrology applications of Laser. 2. Write five advantages of Laser metrology. 3. Draw a setup for Construction of Hologram. 4. Distinguish between Holography and Photography. 5. Setup for diameter measurement using Laser.	15	Rubrics, Rating Scale	External-Practical

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*4*	*12*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Use of Lasers for various services of human being
LO Description	Know various medical applications of Laser (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-12	Medical Applications: - Eye treatment - Laser surgery - Cancer treatment - Dermatology	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	--	Text Books, PPT, Handouts, chalk board, Video lecture- NPTEL and others	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-12	Internal – Assignment & / Progressive	**Student will be asked to** (and/or): 1. List five medical application of Laser**.** 2. Write three advantages of Laser surgery. 3. Explain Laser application for various eye treatments. 4. Describe Laser application in dermatology. 5. Describe Laser application in dermatology.	10	Question paper, Rating scale	Internal-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	*0*	*1*				*5*	*13*	

COURSE NAME	**Laser, Application and Safety**
CO Description	Apply safety precautions for the safe use of Lasers
LO Description	Describe the need of safe practices (Cognitive)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks

LO-13	- Hazards of Laser system
	  - Radiation Hazards
	  - Electrical Hazards
	  - Chemical and Fire Hazards
	- Effect of Radiation on eyes and skin
	- Safety levels/Classes
		Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	9	--	Text Books, PPT, Handouts, chalk board, Video lecture- NPTEL and others.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-13	End Semester Theory Exam	**Student will be asked to**(and/or): 1. List three Hazards of Laser radiation. 2. Explain how Laser beam can be harmful to human eyes and skin. 3. Describe the need of electrical safety while using Laser System. 4. Explain four safety classes of Laser system. 5. Categorized HNe and CO2 Laser safety class.	10	Question paper, Rating scale	External-Theory

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		O	0	1				5	14	

COURSE NAME	**Laser, Application and Safety**
CO Description	Apply safety precautions for the safe use of Lasers
LO Description	Apply safe Practices during high power laser applications (Psychomotor)

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-14	- Protection methods - Safety equipment - Safety precaution - Safety environment.	Lab demonstration, hands on practice, Lab assignments	● Teacher will explain the content in class/lab. ● Teacher with support from lab staff will demonstrate the procedure of lab experiments. ● Student will conduct lab assignment based on these experiments.	-	7	Laser Safety Stickers, Goggles, protective wears, Optical bench, Lab manual	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-14	Practical test in laboratory	**Student will be asked to**(and/or): 1. Explain need of safety precaution for a Laser system. 2. List five safe practices while using high power Laser. 3. Write name of three Laser safety equipments. 4. Describe the choice of goggles for a particular Laser. 5. Describe the need of anti reflecting wall.	10	Rubrics, Rating Scale	Internal-Practical

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)