<table>
<tr><td>1</td><td>Name of Course</td><td>C.C. in Optical Instrumentation
(308106)</td></tr>
<tr><td>2</td><td>Max.Nos. of Student</td><td>25 Students</td></tr>
<tr><td>3</td><td>Duration</td><td>6 Months</td></tr>
<tr><td>4</td><td>Type</td><td>Full Time</td></tr>
<tr><td>5</td><td>Nos Of Days / Week</td><td>6 Days</td></tr>
<tr><td>6</td><td>Nos Of Hours /Days</td><td>7 Hrs</td></tr>
<tr><td>7</td><td>Space Required</td><td>Laboratory = 1000 Sq feet
Class Room = 200 Sq feet
TOTAL = 1200 Sq feet</td></tr>
<tr><td>8</td><td>Entry Qualification</td><td>S.S.C.+ Any Course in Instrumentation Group of MSBVEE</td></tr>
<tr><td>9</td><td>Objective Of Syllabus/ introduction</td><td>Awareness of Safety precautions.
Awareness of Instrumentation.
Awareness of Optical Instrumentation
Awareness of Repair & Maintenance of Optical Instrument.</td></tr>
<tr><td>10</td><td>Employment Opportunity</td><td>The trainee will either to be able to take up jobs with agencies which Develop, maintain and repair Optical Instrument related machines or with working experience will be in a position to start his own independent Business.</td></tr>
<tr><td>11</td><td>Teacher’s Qualification</td><td>Diploma in Instrumentation Engineering. With 3 year Teaching experience in Optical Instrumentation.</td></tr>
<tr><td>12</td><td>Training System</td><td>Training System Per Week
<table><tr><th>Theory</th><th>Practical</th><th>Total</th></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table></td></tr>
<tr><td>13</td><td>Exam. System</td><td><table><tr><th>Sr. No.</th><th>Paper Code</th><th>Name of Subject</th><th>TH/PR</th><th>Hours</th><th>Max. Marks</th><th>Min. Marks</th></tr><tr><td>1</td><td>30810611</td><td>Optical Instrumentation</td><td>TH-I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30810621</td><td>Basic Electronic & Electronics Instrumentation.</td><td>PR-I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30810622</td><td>Optical Instrumentation</td><td>PR-II</td><td>6 hrs</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td>TOTAL</td><td></td><td></td><td>400</td><td>185</td></tr></table></td></tr>
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SYLLABUS

Optical Instrumentation

Practical – II	Theory - I
• Skill and accuracy based work practice on Lathe and Instrument lathe machine, Milling machine and Shapers. • Practice on Use of special attachments, proper clamping and centering of jobs on above machines. • Tools and Cutter grinding practice, using pedestal and surface grinding machine. Grinding practice of taps and reamers. • Practice on three Directional Engineering Machine. • Practice on Heat treatment of steel, (annealing, hardening and tempering). • Visit to Industry to have Demo and understand Honning, Lapping, Ultrasonic machining, electrolyte cutting, surface coating, chemical colouring and powder coating. • Fabrication of conical, cylindrical, cuboids, pyramids, shapes using sheets. • Practice of fitting of lenses and mirrors on Holders for optical instruments. • Visit to Industry to understand lens manufacturing process, and coatings.	Measuring unit system, Precision and errors, construction working of measuring tools like, sale, vernier caliper, micrometer Height gauge, thread ring and plug gauge, various kind of cutting tools. Grinding tools, attachments of grinding machines. Surface Hardening: Introduction of surface hardening, tempering annealing and normalizing, heat treatment method, and hardness testing. Super finishing: Principle of super finishing, electrolytic etching and inachining surface coating, chemical colouring, powder coating, practice on CNC lathe Machine(Trainer Model). OPTICAL PHYSICS: Source of light, nature of light, theories of optical spectrum, Luminance, Luminous flux, Threshold wave length, monochromatic light, reflection, refraction, Absorptions, Transmittance, Radiation, Infrared and ultra violet radiation.
• To verify laws of reflection using plane mirrors. • To find focal length of convex and concave mirrors, by different methods. • To find focal length of convex and concave lenses. • To dismantle and assemble and adjust land test optical bench. • To find magnification of lenses. • To operate optical Disc to understand laws of light. To understand refraction using optical flats.	9. Reflection and refraction, laws of reflection, reflection on plane and curved surface, Lens formula, method of finding of focal length, magnification factor and refractive Index. Optical Flats and their application Prism, light refraction through PRISM, Optical grating. Scattering of light in Atmosphere. Eye glass their types and specification, Magnifying lens and their resolution, Radiometry land Photometery ; Terms related to radiometry and photometry, Laws of illumination, photometry and radiation measuring system.

• To identify, test and practice on use and application of optical sensor land detector. • To plot and study characteristic of LDR, LOD, LDT, Photo voltaic cell.	10. OPTICAL DETECTORS & TRANSDUCERS: Photo emissive cells, photo conductive cells, photo diode, photo transistors, photo voltaic cell, optical transducers, their types and specification, light attenuator and suppressors, photometry radiometry filters Bar Graph : ENCODER & DECODER
• Identification and laser marking. • To familiarize with optical fiber kit • To determine the losses in optical fiber by measuring Input and Output power of optical fiber. • To determine link in optical fiber. • To assemble dismantling of fiber optics kit. Exercise on cable printing and testing.	Principle, construction & parts working, specification and application of telescope (reflection and refractive), Astronomy Telescope, binocular land Epidiascope, Construction, parts nomenclature, specification and working principle of simple and compound microscopes, Application of microscope in different areas, Graticule, Toolmaker, maker microscopes, Diascopes, Construction, working principle of Overhead Balance, physical single pan optical weighing bridges, Construction, working principle, specification and application of Optical Techometers & Stroboscopes
	LASER: Basic principle of laser optics, spontaneous and stimulated emission, Laser action, condition of Laser action, Laser beam, characteristics of Laser beam, concept of coherence, Introduction to semiconductor loser, Gas loser Dylaser and their application.
	FIBER OPTICS : Principle of Fiber Optics, optical fibers, classification of optical fibers, Angle and numerical (N.A.), aperture, properties of optical fiber, Testing method of optical fiber, Application of optical fiber, Mechanical properties of optical fibers, specification of optical fiber, lightening method using fiber optics for Industrial measurement and inspection, Multiple optical fiber, Fiber optics sensors and their advantages.

Basic Electronic & Electronics Instrumentation

Practical - I
Identification of hand tools, Safety Precautions while working in Electronics Lab & Electric Shock Firs Aid, and various measuring instruments, soldering- de- soldering Practice on wire, chassis and on PCB. • Identification specification & testing of various kind of resistances, & capacitors, Measurement by colour code • Familiarize with various types of switches. • Construct circuit with SPST, SPDT, and DPDT switches. • Familiarize miniature and micro switches, reed switches & latches, sockets –connectors & plugs, fuses, terminals, tags, legs & thimbles, Relays and their contacts, • Familiarization with various types of variable resistors, the mister, LDR, VDR. • RC time. Constant
Forward and reverse characteristics of P N junction diode & Zener Diode. • Plotting of various characteristics of Transistor • Biasing method of Transistors • Identification, Specification testing of Junction Diode & Transistors, LED, Zener Diode • Fabrication and assembly of Full wave rectifier Ckt using Diodes, Adding to Pie Filter, • Adding to Series Regulated Ckt using Zener & Series Transistor, • Build of voltage Divider , Doublers
Assemble and observe the outputs of mono stable, bi stable and A-stable multi vibrators using transistors and 1C555. • Assembles and observe the output of two input, two output bi stable multi-vibrator, . • Assemble Astable multi-vibrator as a VCO. • Construct and measure the output of simple inverter, SMPS.& UPS • Characteristics of transistor As switch identification and Testing of FET, • Common Source and common drain Configuration, • Study of switching action of JFET CMOS BMOS & MOSFET. • Construct and measure the output of MOSFET based inverter, SMPS.& UPS
Testing of SCR by multi meter plot the forward characteristics of a SCR • Find the latching current and holding current of SCR, • AC switching circuit by UJT, plot the Characteristics of UJT, Construct and observe outputs of UJT firing circuit, light dimmer circuit, • Characteristics of DIAC, DIAC as a DC pulse generator, characteristics of TRIAC fan regulated • DC motor speed control method and armature current control method, SCR trainer kit.
Integrated Circuits: - Formation of diode, transistor, Resistor and constructional details Different types of ICs. Assemble and verify truth table of OR, AND, NOT gate using discrete components. Verify truth table of NAND, NOR, XOR and XNOR gates. Study the inter conversion of gates by combination of another logic ckts Making of Min and Max Combination ckt using logic gate Study of Digital Logic Lab and perform various experiments of Flip Flops, Registers, and Counters.

Familiarization with common anode, cathode and seven segments, LED display, LCD display and display drivers, • Construct and observe output of resistive network and binary ladder. • D/A converter, observe the output of comparator with different inputs, • Familiarize with A/D converter • Familiarize with memory ICs, parallel expansion of memory ICs, EPROM ICs, EPROM programmer
Measurement of LC & R, using LCR Bridge, Digital LC & R meter
Measurement of AC, DC voltage, current using all types of Analog and digital meters, ramp type, Integrating type, Continuous Balance type. Study complete method of use of digital millimeter for its complete measurement provision like V,I,R, db, Temperature, capacitance, feature of testing of semiconductors, Frequency, feature of hold and memory provision
Use of Analog and Digital Frequency meter/Counter , Various Type of Timer, Timers and controllers Familiarization with operation, use & application of CRO in detail .Measurement of Freq., Voltage, Phase & Phase Difference using Single, Dual Trace, Storage Type Oscilloscope. Seeing and comparative analysis of wave shape using Oscilloscope. Plotting of Lissagus Pattern Familiarization with operation and use of various kind of signal generator, function generator, pulse generator

List of Tools & Equipments for Optical Instrumentation

S No	Name of Tool & equipment	Qty
1.	Screw Drivers 100mm	10 Nos.
2.	Screw Drivers 150 mm	10 Nos.
3.	Screw Drivers 300mm	10 Nos.
4.	Screw Drivers Heavy Duty	10 Nos.
5.	Screw Drivers Star Type	10 Nos.
6.	Screw Drivers Set	10 Nos.
7.	Screw Driver Set Philips Type	10 Nos.
8.	Neon Tester	10 Nos.
9.	Caliper out side 15 Cm	10 Nos.
10.	Caliper Inside	10 Nos.
11.	Divider Inside	10 Nos.
12.	Scriber 15 Cm	10 Nos.
13.	Vernier Caliper	10 Nos.
14.	Micro meter	10 Nos.
15.	Sphero meter	10 Nos.
16.	Vernier Height Gauge	10 Nos.
17.	Bevel protractor	10 Nos.
18.	Combination Pliers	10 Nos.

19.	Long Nose Pliers,	10 Nos.
20.	Side Cutting Pliers	10 Nos.
21.	Wire Stripers	10 Nos.
22.	Crimping and Clamping Pliers	8 Nos.
23.	Hand Drill machine	8 Nos.
24.	Moterised portable drill machine	4 Nos.
25.	Drill bit set	4 Nos.
26.	Hammer ball pein 0.250 Kg	4 Nos.
27.	Hammer ball pein 0.500 Kg	4 Nos.
28.	Hammer cross pein 0.250 kg	2 Nos.
29.	Hack Saw frame 200mm	8 Nos.
30.	Tri square	10 Nos.
31.	Tenon saw	4 Nos.
32.	Steel Rule 30 Cm	10 Nos.
33.	Files Flat 2nd Cut 150mm & 300mm	4 Nos.
34.	File Flat Smooth 150 mm & 300 mm	4 Nos.
35.	File Round smooth	10 Nos.
36.	File Half Round Smooth	10 Nos.
37.	File Half Round 2nd Cut	10 Nos.
38.	File Half Round 2nd cut	10 Nos.
39.	Steel Rule & Steel tape	4 Nos.
40.	Straight edge 45o mm Steel	4 Nos.
41.	Surface plate 45X45 Cm	4 Nos.
42.	Universal Scrubbing block	4 Nos.
43.	Taps & Dies Set Complete in B A threads	4 Nos.
44.	Taps & Dies Set Complete up to 15mm by .55 mm in metric system	4 Nos.
45.	Can oil 0.25 Lts	4 Nos.
46.	Can oil 0.5 Lts	4 Nos.
47.	Chisel Cold 19mm flat	4 Nos.
48.	Chisel Cold 25 mm	4 Nos.
49.	"C" Clamp 5 cm	10 Nos.
50.	Bench Vice 12 Cm jaw	8 Nos.
51.	Stake hetch	4 Nos.
52.	Stake hetch Round	4 Nos.
53.	Anvil Face 12 cm X 7 Cm	4 Nos.
54.	Hammer Planishing	4 Nos.
55.	Sheer tin-man's 25 Cm	10 Nos.
56.	Snip Straight 20 Cm	4 Nos.
57.	Snip Curved 20 Cm	4 Nos.
58.	Rivet Set and snap combined 4mm	4 Nos.
59.	Double ended and Box spanners set	8 Each
60.	Bit center 6,8,10, 122 mm	8 Nos.
61.	Auger 12, 16, 20, 22 & 25 mm	8 Nos.
62.	Firmer Gauge 6,8,10,12,15mm	8 Nos.
63.	Standard Sheet metal gauge	8 Nos.
64.	Soldering Iron 15W	10 Nos.

65.	Soldering Iron 30W	10 Nos.
66.	Soldering Iron 65W	4 Nos.
67.	Soldering Gun 250 W	4 Nos.
68.	Temperature Control Soldering & Desoldering Station 15W	4 Nos.
69.	C D Drives (Laser)	4 Nos.
70.	CD Drives Alignment Kit with Software	2 Nos.
71.	Photo voltaic Cell, Photo diode, LDT, Trainer Kits with some application provision	2 Nos.
72.	Optical pyrometer	
73.	Laser Optics Trainer Kit with attachment	2 Nos.
74.	Tong tester with all Voltage current and continuity testing	8 Nos.
75.	Brad Board with + 5v, +12 V Power supply, & pulse generator	
76.	Singe phase Wattmeter 230v 5kVA	4 Nos.
77.	Earth tester	4 Nos.
78.	Analog Multimeter	4 Nos.
79.	Digital Multimeter 4 -1/2 Digit with capacitance, inductance, frequency and db, temperature Measurement facility	4 Nos.
80.	Drilling Machine 0-12mm moterised with Chucks, Keys All Accessories	2 Nos.
81.	Instrument Lath Machine with all accessories and attachments	4 Nos.
82.	High Precision Lathe Machine with all accessories and attachments	4 Nos.
83.	Pedestal Grinder with wheels with all accessories and attachments	2 Nos.
84.	Surface Grinding Machine with all accessories and attachments	2 Nos.
85.	Milling Machine universal with all accessories and attachments	2 Nos.
86.	Milling Machine Horizontal all accessories and attachments	2 Nos.
87.	Milling Machine vertical with all accessories and attachments	2 Nos.
88.	Shaper machine Milling Machine universal with all accessories and attachments	4 Nos.
89.	X Y Z Direction Engraving Machine	2 Nos.
90.	Carbide Cutter Set	As Reqd
91.	Double ended Buffing Machine with detachable buffing wheels	2 Nos.
92.	Optical Bench with all Milling Machine universal with all accessories and	8 Nos.