

COURSE TEMPLATE

1.	Department/Center proposing the course	Center for Biomedical Engineering
2.	Type of course (Elective/Core)	Core
3.	Course number (to be given by UG/PG representative of the department/Center)	BM607
4.	Course Title (< 45 characters)	MEDICAL DEVICES AND EQUIPMENT
5.	L-T-P-S-C structure L=Lecture, T= Tutorials, P=Practicals, S=Self Study, C=Credits T= L / 3 (Optional), S = 2L-T+P/ 2 , C=L+P/2	3-0-2-6-4
6.	Objective of the course: To familiarize the students with principles and operations of various medical devices used in modern healthcare.	

7.	<p>Targeted Knowledge Profile: please double-click and cross the applicable box(es))</p> <p><input type="checkbox"/>WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline.</p> <p><input checked="" type="checkbox"/>WK2: Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.</p> <p><input type="checkbox"/>WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.</p> <p><input checked="" type="checkbox"/>WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.</p> <p><input checked="" type="checkbox"/>WK5: Knowledge that supports engineering design in a practice area.</p> <p><input checked="" type="checkbox"/>WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.</p> <p><input checked="" type="checkbox"/>WK7: Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.</p> <p><input checked="" type="checkbox"/>WK8: Engagement with selected knowledge in the research literature of the discipline.</p>
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8.	<p>Targeted Graduate Attribute Profiles: please cross the applicable box(es)</p> <p><input checked="" type="checkbox"/>WA1: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems.</p> <p><input checked="" type="checkbox"/>WA2: Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4)</p> <p><input checked="" type="checkbox"/>WA3: Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (WK5)</p> <p><input checked="" type="checkbox"/>WA4: Conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.</p> <p><input checked="" type="checkbox"/>WA5: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. (WK6)</p> <p><input checked="" type="checkbox"/>WA6: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (WK7)</p> <p><input checked="" type="checkbox"/>WA7: Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7)</p> <p><input type="checkbox"/>WA8: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7)</p> <p><input checked="" type="checkbox"/>WA9: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.</p> <p><input checked="" type="checkbox"/>WA10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</p> <p><input type="checkbox"/>WA11: Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</p> <p><input type="checkbox"/>WA12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.</p>
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9.	<p>Pre-requisites (if IIT Ropar course mention course No. and title else topic or none)</p>	<p>None</p>
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10.	Status vis-à-vis other courses (give course number/title)	
10.1	Overlap with any UG/PG course of the Dept./Centre (Yes/No)	None
10.2	Overlap with any UG/PG course of other Dept./Centre (Yes/No)	None
10.3	Supersedes any existing course (Yes/No)	No
	If yes, departmental recommendation be attached	

11.	Frequency of offering (please cross the box)	<input type="checkbox"/> Every sem <input type="checkbox"/> 1 st sem <input type="checkbox"/> 2 nd sem <input checked="" type="checkbox"/> Either sem <input type="checkbox"/> Induction Program <input type="checkbox"/> Summer Semester
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12.	Faculty proposing the course	Dr. Ashish Kumar Sahani
	Faculty members who will teach this course	Dr. Ashish Kumar Sahani
13.	Will the course require any visiting faculty? (Yes/No)	Yes

14.	Module-wise Course Contents (Include laboratory/design activities):		
	Module No. and Title	No. of Lectures / Lab Hours	Module Description
	1. Equipment for General Medical Practice	3/2	Equipment used by general medical practitioners such as stethoscope, syringe, needles, blood pressure monitor, weight and height scales, ECG, thermometer, bandage, tongue depressors etc.
	2. Ophthalmic equipment	6/4	The equipment used in ophthalmology such as eye chart, ophthalmoscope, retinoscope, auto refractometer, air-puff tonometer, slit-lamp and trial-lens set etc.
	3. ENT and Dental Equipment	6/2	Audiometer, autoscope, hearing aid, dental equipment, spirometer etc.
	4. Orthopaedic Equipment	6/2	Electronics muscle stimulator, Wheel chair, crutch, arm-slings, neck and shoulder support, orthopedic surgical equipment, artificial limbs etc.
	5. Biochemistry Analysers	3/2	Semi-automatic biochemistry analyzer, paper strip diagnostics, glucometer etc.
	6. ICU Equipment	6/4	Dialysis machine, electro-surgery, multipara monitor, defibrillator, ventilator, infusion pump, Catheterization and stent placement setup, pulse-oximeter, pacemaker, syringe pump etc.
	7. Medical Imaging and signal acquisition systems	6/4	Medical imaging equipment such as ultrasound, MRI, FMRI, CT, X-Ray and thermal camera, EEG.
	8. Simulation and Design	3/4	Finite element modeling and simulation, Geometric design to 3D printing

	9. Medical Device Safety and Standards	3/0	Standards of manufacturing and safety for medical devices.																										
15.	Suggested texts and reference materials (If any) Text Books (Please mention author, title, name of publisher, edition and year of publication)																												
<table border="1"> <thead> <tr> <th data-bbox="297 268 488 327">Author(s)</th> <th data-bbox="488 268 704 327">Title</th> <th data-bbox="704 268 836 327">Publisher</th> <th data-bbox="836 268 1073 327">Edition and Year</th> <th data-bbox="1073 268 1300 327">ISBN</th> </tr> </thead> <tbody> <tr> <td data-bbox="297 327 488 428">Steven Schreiner, Joseph D. Bronzino, Donald R. Peterson</td> <td data-bbox="488 327 704 428">Medical Instruments and Devices: Principles and Practices</td> <td data-bbox="704 327 836 428">CRC Press</td> <td data-bbox="836 327 1073 428">1,2017</td> <td data-bbox="1073 327 1300 428">978-1138748521 (ISBN-13)</td> </tr> <tr> <td data-bbox="297 428 488 529">John G Webster</td> <td data-bbox="488 428 704 529">Medical Instrumentation: Application and Design</td> <td data-bbox="704 428 836 529">John Wiley & Sons</td> <td data-bbox="836 428 1073 529">4th edition,2009</td> <td data-bbox="1073 428 1300 529">978-0471676003 (ISBN-13)</td> </tr> <tr> <td data-bbox="297 529 488 600">Joseph D. Bronzino, Donald R. Peterson</td> <td data-bbox="488 529 704 600">Medical Devices and Human Engineering</td> <td data-bbox="704 529 836 600">CRC Press</td> <td data-bbox="836 529 1073 600">1st Ed.</td> <td data-bbox="1073 529 1300 600">978-1439825259 (ISBN-13)</td> </tr> <tr> <td data-bbox="297 600 488 747">Seeram Ramakrishna et al.</td> <td data-bbox="488 600 704 747">Medical Devices: Regulations, Standards and Practices (Woodhead Publishing Series in Biomaterials)</td> <td data-bbox="704 600 836 747">Woodhead Publishing</td> <td data-bbox="836 600 1073 747">1st Edition</td> <td data-bbox="1073 600 1300 747">978-0081002896 (ISBN-13)</td> </tr> </tbody> </table>					Author(s)	Title	Publisher	Edition and Year	ISBN	Steven Schreiner, Joseph D. Bronzino, Donald R. Peterson	Medical Instruments and Devices: Principles and Practices	CRC Press	1,2017	978-1138748521 (ISBN-13)	John G Webster	Medical Instrumentation: Application and Design	John Wiley & Sons	4th edition,2009	978-0471676003 (ISBN-13)	Joseph D. Bronzino, Donald R. Peterson	Medical Devices and Human Engineering	CRC Press	1 st Ed.	978-1439825259 (ISBN-13)	Seeram Ramakrishna et al.	Medical Devices: Regulations, Standards and Practices (Woodhead Publishing Series in Biomaterials)	Woodhead Publishing	1st Edition	978-0081002896 (ISBN-13)
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16.	Planned learning experience (in hours) <input checked="" type="checkbox"/> Black Board: <input checked="" type="checkbox"/> Presentation (PowerPoint slides etc.): <input type="checkbox"/> Drawing Board: <input type="checkbox"/> Desktop Computer: <input checked="" type="checkbox"/> Laboratory Equipments: <input type="checkbox"/> Industrial Visits: <input checked="" type="checkbox"/> Guest Lectures: <input checked="" type="checkbox"/> Project-based Learning: <input type="checkbox"/> Others (Specify):																												

17.	Week-wise brief description of lecture activities, if any:
Week No.	Lecture description
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

9.	
10.	
11.	

18.	Week-wise brief description of laboratory/practical activities, if any:
Week No.	Description of Experimental/Laboratory/Practical Activity
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	

19.	Course Evaluation Plan (percentage) <input type="checkbox"/> Homework: <input checked="" type="checkbox"/> Quizzes: 10 <input checked="" type="checkbox"/> Mid-Semester Written Exam: 20 <input type="checkbox"/> Mid-Semester Viva Voce: <input checked="" type="checkbox"/> End-Semester Written Exam: 30 <input type="checkbox"/> End-Semester Viva Voce: <input checked="" type="checkbox"/> Laboratory Report: 10 <input checked="" type="checkbox"/> Hands-on Project: 30 <input type="checkbox"/> Research Project: <input type="checkbox"/> Presentation: <input type="checkbox"/> Others (Specify):
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	Course proposer:
ACUGS / RPEC Member:	HOD/HOC:
Associate Dean (UG/PG):	Dean (Academics):