



**Proposal to initiate**

**Master of Science- Health Economics and Technology Assessment**

**(HETA)**



सत्यमेव जयते



**Health Technology Assessment in India (HTAI)**  
**Department of Health Research**  
**Ministry of Health and Family Welfare**  
**Government of India**



# **Master of Science Health Economics and Technology Assessment (HETA)**

**Course formulated  
by**

**Health Technology Assessment India-HTAI, DHR, Govt of India, New Delhi  
Post Graduate Institute of Medical Education & Research, Chandigarh  
ICMR-National Institute of Epidemiology, Chennai  
and**

**Approved by the Medical Technology Assessment Board**

**Background:**

- Health Technology Assessment (HTA): A multidisciplinary decision-making process that uses information about the medical (clinical), social, economic, organizational and ethical issues related to the use of a HT (such as medicines, vaccines, biologicals, medical devices and clinical interventions) in a systematic, transparent, unbiased, and robust manner.
- HTA aims to support the formulation of safe and effective health policies that are patient focused and seek to achieve best value of money and improved patients' health outcomes.
- In India HTA board was approved as MTAB board in 2016 and the division is operational by the name of Health Technology Assessment in India (HTAI).
- HTAI has 16 Resource centers and Technical partners across India.
- One such HTA resource Centres is established and functional at PGI Chandigarh ICMR-NIE.



### **Need for the Course:**

- Health Technology Assessment is rapidly expanding its scope for evidence-based policy decision making.
- There is need to conduct quality HTA studies to support healthcare policy decisions
- There is limited or lack of Trained human resource to undertake HTA studies in the country.
- There is largely limited HTA training facility or formal courses offered in India.
- Hence there is need to initiate the formal Masters level specialised degree program to cater the need the trained human resources in HTA.

### **Goals of the program:**

- To provide trained human resource with a critical understanding of the processes of HTA
- To create trained human resource who can evaluate
  - Economic, Social and Ethical impacts of health interventions
  - Health policy or health technology and its role in priority setting

### **Program objectives:**

- To provide the students
  - A broad understanding of the core areas of Health economics and Technology Assessment
  - Experiential learning using real-world examples, emphasizing India specific case studies, compared with other countries
  - Experiences exchanged through seminars and discussions guided by experts as



visiting professors

- Through student dissertation topics, which addresses some of current HTA questions in India

### **Course description:**

- Credit-based evaluation system
- Two years course with 4 semesters
- Each semester of 6 months duration (100days \* 6 hours per day \* 5 working days per week)
- Per semester 600 teaching hours with 15 credits and one field/educational visit per semester (one credit = 30 hours of teaching, (One week of teaching =1 credit)
- The last semester on Dissertation.
- The first semester includes Introduction to basic concepts
- The second semester covers advanced concepts in health economics
- The third Semester provides hands-on conducting economic evaluation, systematic review and meta-analysis
- The fourth semester: Dissertation work on HTA interest

**Mode of entry:** Open call and through Entrance examination

**Essential Qualification:** Bachelor degree in medicine, economics, health and allied/Life sciences  
Medical graduates (MBBS), Dental graduates (BDS), Graduates of AYUSH (BAMS, BNYS,



BUMS, BSMS, BHMS) graduates of four-year degree programs in Veterinary/Nursing Sciences, Bachelor of Physiotherapy, Bachelor of Occupational Therapy, Bachelor of Pharmacy, or students with an undergraduate degree in Statistics/Biostatistics, Economics,

**Number of students:** 8-10 per batch/Centre

**Quality assurance:** The quality of the training programme will be assured by:

- Documentation of the teaching/learning material;
- Use of peer-review to develop improved learning tools;
- On-going evaluation of the teaching by the scholars;
- Monitoring of the acquisition of the core competencies through mentoring
- Evaluation of all the field project reports with standardized checklists,
- Capacity building of the teaching faculty in pedagogic techniques
- Periodic review by experts in the field

## **Student Evaluation**

### **Attendance:**

Scholars are expected to attend the classes regularly. A minimum of 85% attendance will be required for the scholars to appear for the final evaluation of each course. Scholars who have less than 50% attendance in any course will not be eligible to appear for the examination and will have to re-appear for the course when the same is offered during the next academic year. The scholar will have a maximum of three chances for passing a course.



### Dissertation:

Each dissertation will be evaluated by two external reviewers from the panel duly selected by NIE with the approval of competent authority (PGI Chandigarh). The scholars will also present the findings of their dissertation in the *viva-voce*, which will be conducted by an external examiner. The final grade for the dissertation will be the average of the grades given by the two external reviewers and the external examiner.

### Grading system

Grade	Performance	Percentage	Grade points
A+	Outstanding	≥95%	4
A	Excellent	90% to 94%	3.5
A-	Very good	80-89%	3
B+	Good	70-79%	2.5
B	Average	60-69%	2
B-	Satisfactory	50-59%	1.5
C	Fail	Below 50%	0

**Calculation of Cumulative Grade Point Average (CGPA):** CGPA is the weighted average of numerical values of grades with credits as weights and will be calculated using the following formula: {[Sum of (Credit X Grade point) for all modules]/60}

CGPA can be converted into percentage using the formula  $(CGPA \times 100)/4$ .

**Re-examination:** In case of failure in any of the courses, one more chance will be given to reappear for examination within three months. If any candidate fails for the second time, the candidate will have to reappear for the course when the same is offered in subsequent academic years within a span of three years of his admission. In such instances, the candidate will have to



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obtain prior approval from the competent authority. The maximum grade that will be awarded for a re- examination will be limited to C.

**Criteria for award of the degree:** The minimum for pass in each course and field projects including dissertation will be grade E. For the award of the MPH degree, the student must obtain a minimum of grade E in all the courses and field projects with a minimum CGPA of 2 in total.



### Course Summary:

Semester	Module	Credits (teaching hours)
<b>Semester I: (Introductory knowledge- Basics)</b>		
I	Principle and concept of Health Technology Assessment	3 (90 hrs.)
I	Principle and concept of Health policy and Health systems	3 (90 hrs.)
I	Principle of Economic for Health technology assessment	3 (90 hrs.)
I	Research Methodology	3 (90 hrs.)
I	Introduction to Biostatistics	1 (30 hrs.)
I	Evidence-based Medicine	2 (60 hrs.)
	Selection of 3 Broad areas of interest for Dissertation	
<b>Semester II: (Advanced concepts and Health Economics specific)</b>		
II	Biostatistics - II	3 (90 hrs.)
II	Priority setting in universal health coverage	3 (90 hrs.)
II	Economic evaluation in Health	3 (90 hrs.)
II	Pharmacoeconomics	1 (30 hrs.)
II	Effectiveness and efficiency in Health	2 (60 hrs.)
II	Health equity and social impact of Health technology	3 (90 hrs.)
	Dissertation protocol development/Selection of 3 specific topics/ Problem statement of HTA interest,	
<b>Semester III: (Application-based)</b>		
III	Costing in Health	4 (120 hrs.)
III	Measuring Health outcomes	2 (60 hrs.)
III	Model-based Economic Evaluation	5 (150 hrs.)
III	Evidence Synthesis	4 (120 hrs.)
	Protocol, Tool/ Questionnaire development for Dissertation	
<b>Semester IV: (Dissertation work)</b>		
IV	Dissertation work, Data collection, synthesis, Analysis, Dissertation submission and defence	15 (450 hrs)
	<b>Total Credits</b>	<b>60 (1800 hrs.)</b>



## **Expected Outcomes**

- Trained human resource with
  - Conceptual understanding of HETA methods, current public health challenges
  - Technically-competent graduates with an adequate understanding of HTA processes
  - Skills required to conduct evidence-based planning to strengthen the health system
- Relevant research studies necessary to inform policies in India
- This course will equip the graduates with comprehensive knowledge, subject specific expertise, specialized skills and a supporting network to sculpt their career in HETA

# Semester-I

## Course Syllabus:

**Semester 1**

**Total Duration - 6 Months**

**Semester Description:** The first semester introduces the basic concepts of Health Economics, Health Technology Assessment and Research Methods that enable the students to understand the health issues from an Economics perspective. This semester also intends to provide a better understanding on the research and evidence synthesis for an efficient utilization of HTA techniques in the healthcare sector.

### Semester Modules:

SI No	Module	Credits (Teaching Hours)	Weeks (6hr/day * 5 Days)
1	Principle and Concept of Health Technology Assessment	3 (90 hrs)	3 Weeks
2	Principle and concept of Health policy and Health systems	3 (90 hrs)	3 Weeks
3	Principle of Economics for Health Technology Assessment	3 (90 hrs)	3 weeks
4	Research Methodology	3 (90 hrs)	3 Weeks
5	Introduction to Biostatistics	1 (30 hrs)	1 week
6	Evidence-Based Medicine	2 (60 hrs)	2 Weeks
	Submission of three broad areas of interest for Dissertation		
	<b>Total</b>	<b>15 (600 hrs)</b>	<b>15 weeks</b>

## Semester-I

### Module 1: Principle and Concept of Health Technology Assessment

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Principle and Concept of Health Technology Assessment</b>
Number of Credits/ Teaching hours	3/90 hrs
Session/Academic Year	Semester 1/ Year 1
Course Description	This module covers the principle and concept of Health Technology Assessment and Application of HTA at policy level.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Define the concept of Health Technology Assessment</li> <li>● Describe the role and impact of HTA in health care resource allocation decision, priority settings, and health care policy</li> <li>● Explain basic concepts of assessing effectiveness, safety, social and economic impact, ethics and equity in health technology assessment</li> <li>● Compare the HTA process and its role in decision making and priority setting in several countries</li> <li>● Explain the strategy to communicate HTA evidence with stakeholders during decision making and policy formulation</li> <li>● Construct a disease management pathway to illustrate current management of a health condition</li> </ul>
Course Outline	Introduction to HTA- Definitions of HTA- Key principle of HTA- Role of HTA in health policy decision making- Assessing Effectiveness, safety, and Health Related Quality of Life - Assessing value for money of health technology- Economic evaluation - Budget impact analysis- Assessing social impact of health technology- HTA process - Pattern and Process of involving stakeholders in HTA and priority setting- Ethical and equity assessment in HTA- Current HTA situation- HTAIn, HTA process in India, Role of HTA in India- How to communicate HTA evidences with stakeholder?
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Health Technology Assessment in India-A Manual- HTAIn (<a href="https://htain.icmr.org.in/images/pdf/htain%20manual.pdf">https://htain.icmr.org.in/images/pdf/htain%20manual.pdf</a>)</li> <li>2. Process manual and Quality check Guidance-             <ol style="list-style-type: none"> <li>a. (Accessed from <a href="https://htain.icmr.org.in/virtual-library/htain-manuals">https://htain.icmr.org.in/virtual-library/htain-manuals</a> )</li> </ol> </li> </ol>

## Semester-I

	<ol style="list-style-type: none"> <li>3. Chootipongchaivat S, Tritasavit N, Luz A, Teerawattananon Y, Tantivess S. 2016. Conductive Factors to the development of health technology Assessment in Asia. Amarin Printing and Publishing Public Co., Ltd: Bangkok.</li> <li>4. <a href="http://www.idshealth.org/wp-content/uploads/2016/02/CONDUCTIVE-FACTORS-TO-THE-DEVELOPMENT_resize.pdf">http://www.idshealth.org/wp-content/uploads/2016/02/CONDUCTIVE-FACTORS-TO-THE-DEVELOPMENT_resize.pdf</a></li> <li>5. Drummond MF, Schwartz JS, Jonsson B, Neumann PJ, Siebert U, Sullivan SD. Key principles for the improved conduct of health technology assessment for resource allocation decision. <i>International Journal of Technology Assessment in Health Care</i>. 2008; 24:3: 244-258.</li> <li>6. Luce BR, Drummond M, Jonsson B, Neumann PJ, Schwartz JS, Siebert U, Sullivan SD. EBM, HTA, and CER: Clearing the confusion. <i>The Milbank Quarterly</i>. 2010; 88,2: 256-276.</li> <li>7. Kieslick K, Bump JB, Norheim OF, Tantivess S, Littlejohns P. Accounting for technical, ethical, and political factors in priority setting. <i>Health Systems &amp; Reform</i>. 2016; 2(1): 51-60.</li> <li>8. Widrig D, Tag B HTA and its legal issues: a framework for identifying legal issues in health technology assessment. <i>Int J Technol Assess Health Care</i>. 2014 Dec;30(6):587-94</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-I

### Module 2: Principle and concept of Health policy and Health systems

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Principle and concept of Health policy and Health systems</b>
Number of Credits/ Teaching hours	3/90 hrs
Session/Academic Year	Semester 1/ I Year
Course Description	This module introduces the principles and concepts of health policy formulation, applications of social science theories in the policy processes to make health policies which are relevant to socioeconomic and political contexts, especially in Low Middle Income Countries settings.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Familiarize students with principles and concepts of systems thinking.</li> <li>● Promote systematic approaches to identify underlying problems in health care delivery which may lead to undesirable results of patient care.</li> <li>● Explore models of health care delivery to improve effectiveness, efficiency, and equity in healthcare</li> <li>● Explore the current issues of health and healthcare policy in India and other countries</li> </ul>
Course Outline	Systems thinking and the building blocks of health systems- functions and goals of healthcare organizations and health systems- concepts of healthcare quality- healthcare efficiency- health equity- Social determinants of Health, health promotion, and social entrepreneurship in health systems- Delivery of primary care, ambulatory care, chronic care, acute care, emergency care, long-term care, palliative care, and end-of-life care - Healthcare financing and health insurance systems- Health policy process and healthcare reform.
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. World Health Organization. Everybody business - strengthening health systems to improve health outcomes: WHO's framework for action. The WHO Document Production Services, Geneva, Switzerland: World Health Organization; 2007.</li> <li>2. The Institute of Medicine (2001). Crossing The Quality</li> </ol>

## Semester-I

	<p>Chasm: A New Health System for The 21st Century. Committee on Quality Health Care in America, Institute of Medicine. Washington, D.C.: National Academy Press.</p> <ol style="list-style-type: none"><li>3. Garwande, A. (2002). Complications: a surgeon's notes on an imperfect science. NewYork, NY: Picador Press.</li><li>4. Roberts, M. J., Hsiao, W., Berman, P., &amp; Reich, M. R. (2004). Getting health reform right: a guide to improving performance and equity. New York, USA: Oxford University Press.</li><li>5. Meadows, D. H. (2009). Thinking in Systems: A Primer. London: Earthscan.</li><li>6. Aday, L. A., Begley, C. E., Lairson, D. R., &amp; Balkrishnan, R. (2013). Evaluating the healthcare system: effectiveness, efficiency, and equity. Chicago, IL: Health Administration Press.</li></ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-I

### Module 3: Principle of Economics for Health Technology Assessment

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Health care Financing (separate modules)</b>
Number of Credits/ Teaching Hours	4/ 120 hrs. (2 for Micro, 2 healthcare financing.)
Session/Academic Year	Semester 1/I Year
Course Description	This module covers both microeconomics, macroeconomics introducing the concepts of economic behaviors of individual consumers, firms, markets, money, banking and national income. Introduction to the concepts and modes of Healthcare financing.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Describe key concepts of microeconomics and macroeconomics</li> <li>● Apply microeconomic analysis including the behavior of consumers and firms in health sector</li> <li>● Explore models that determine long-run growth and short-term fluctuations in national economies and the role of government regulation, monetary policy and fiscal policy.</li> <li>● Analyze markets for goods and services and policy choices that affect markets - on national production, employment, inflation and interest rates</li> <li>● Healthcare Financing: Revenue raising, pooling of funds, purchasing of services, introduction to different healthcare Insurance systems with examples from different healthcare systems across the world.</li> </ul>
Course Outline	<p>Introduction to Microeconomics and Macroeconomics- The Supply and Demand Model- equilibrium in a market economy, the competitive equilibrium model, market equilibrium and efficiency, firms and industries changing over Time- Consumer behavior and analyzing consumer decisions- the impact of uncertainty on consumer behavior, Firms and their decisions about optimal production- Market and Competition - The impact of different market structures on firms' behavior- Public Goods and Externalities- Government Failure and Success - Markets for Physical Capital - Financial Markets: Risk and Return- Macroeconomic Ideas on measuring production, income and spending of nations- Productivity, Economic Growth and Determining Factors - Money and Inflation- Economic Fluctuations.</p> <p>Healthcare financing: Revenue raising: sources of funds, including government budgets, compulsory or voluntary prepaid insurance schemes, direct out-of-</p>

## Semester-I

	<p>pocket payments by users, and external aid)</p> <p>pooling of funds: the accumulation of prepaid funds on behalf of some or all of the population</p> <p>purchasing of services: the payment or allocation of resources to health service providers, different payment methods.</p> <p>Introduction to different healthcare Insurance systems, several</p>
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Karl E. Case and Ray C. Fair, Principles of Economics, Pearson Education, Inc., 8th edition, 2007.</li> <li>2. Gregory Mankiw, Economics: Principles and Applications, India edition by South Western, a part of Cengage Learning, Cengage Learning India Private Limited, 4th edition, 2007.</li> <li>3. Joseph E. Stiglitz and Carl E. Walsh, Economics, W.W. Norton &amp; Company, Inc., New York, International Student Edition, 4th edition, 2007.</li> <li>4. Hal R. Varian, Intermediate Microeconomics: A Modern Approach, W.W. Norton and Company/Affiliated East-West Press (India), 8th edition, 2010. The workbook by Varian and Bergstrom may be used for problems.</li> <li>5. C. Snyder and W. Nicholson, Fundamentals of Microeconomics, Cengage Learning (India), 2010.</li> <li>6. B. Douglas Bernheim and Michael D. Whinston, Microeconomics, Tata McGraw-Hill (India), 2009.</li> <li>6. Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010.</li> <li>7. Gregory Mankiw. Macroeconomics, Worth Publishers, 7th edition, 2010.</li> <li>8. Dornbusch, Fischer Macroeconomics, McGraw Hill, 6th edition</li> <li>9. Olivier Blanchard, Macroeconomics, Pearson Education, Inc., 5th edition, 2009.</li> <li>10. Richard T. Froyen, Macroeconomics, Pearson Education Asia, 2nd edition, 2005.</li> <li>11. Andrew B. Abel and Ben S. Bernanke, Macroeconomics, Pearson Education, Inc., 7th edition, 2011.</li> <li>12. Debraj Ray, Development Economics, Oxford University Press, 2009.</li> <li>13. Partha Dasgupta, Economics: A Very Short Introduction, Oxford University Press, 2007.</li> <li>14. Abhijit Banerjee, Roland Benabou and Dilip Mookerjee, Understanding Poverty, Oxford University Press, 2006.</li> <li>15. Amartya Sen, Development as Freedom, Oxford University Press, 2000.</li> </ol>



## Semester-I

Instructors	
Course Coordinator	
Venue of Study	

## Semester-I

### Module 4: Research Methodology for Health Technology Assessment

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Research Methodology for Health Technology Assessment</b>
Number of Credits/ Teaching Hours	3/ 90hrs
Session/Academic Year	Semester 1/ I year
Course Description	This module focuses on research methodology for health technology assessment.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Know how to contemplate a research proposal</li> <li>● Understand correct ways to cite scientific literature</li> <li>● Explain differences between different research methods</li> <li>● Critically appraise different study designs</li> <li>● Analyze, set as contrast, compare and review relevant scientific literature</li> <li>● Discuss own view in relation to the published research</li> <li>● Writing a research plan</li> </ul>
Course Outline	Introduction to Research Methodology for Health Technology Assessment- research problem and writing research questions- Literature review- Research ethics, Introduction to epidemiology, Epidemiology principles and methods, study designs, Research design and Research method for HTA- Observational study- Experimental study- Diagnostic study- Introduction to Qualitative and Quantitative Research: Sampling, Data Collection Techniques - Interpreting Data- Analysis Procedures, Coding - Scientific writing
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Cohen, L. Lawrence, M., &amp; Morrison, K. (2005). Research Methods in Education (5th edition). Oxford: Oxford University Press.</li> <li>2. Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher</li> <li>3. Fundamentals of modern statistical methods by Rand R.wilcox</li> </ol>

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	<ol style="list-style-type: none"><li>4. Kumar, R. (2011). Research Methodology: a step-by-step guide for beginners (3rd edition). London, UK: TJ International Ltd, Padstow, Cornwall.</li><li>5. Singh, Y. K. (2006). Fundamental of Research Methodology and Statistics. New Delhi. New International (P) Limited, Publishers</li><li>6. Wallinman, N. (2006). Your Research Project: A step-by-step guide for the first-time researcher. London: Sage Publications</li></ol>
Additional suggested reading materials	
Instructors	
Course Coordinator	
Venue of Study	

## Semester-I

### Module 5: Evidence-Based Medicine

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Evidence-Based Medicine</b>
Number of Credits	2/60 hrs
Session/Academic Year	Semester 1/I Year
Course Description	This module is intended for students to acquire knowledge and skills to determine the validity of clinical research and findings.
Course Objectives	<ul style="list-style-type: none"> <li>● Define EBM and its process.</li> <li>● Learn about different databases for searching the scientific literature.</li> <li>● Conduct search of clinical evidences using appropriate terms and tools.</li> <li>● Critical appraisal of literature</li> </ul>
Course Outline	<p>Evidence Based Medicine- Use of evidence in health care- Formulating the research question: Population/intervention/control/outcomes/setting /study design/timeframe – Search for evidence: Type, sources of evidence- Specialized search engines / Databases: Medline, Embase, Cochrane Library, MeSH terms, Boolean operators – Filter and synthesize evidence- approaches to clinical research design and statistical tests: systematic reviews, meta-analyses, randomized controlled trials, case-control studies, cohort studies, descriptive studies, and qualitative studies. standard EBM measures - number needed to treat, number needed to harm, event rates, relative risk, odds ratios, sensitivity, and specificity.</p>
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Guyatt G, Rennie D, Meade MO, Cook DJ, eds. Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice. 2nd Ed. New York, NY: McGraw-Hill; 2008.</li> <li>2. Straus SE, Glasziou P, Richardson WS, Haynes RB. Evidence-Based Medicine. How to practice and teach EBM. Edinburg: Elsevier Churchill Livingstone, Fourth</li> </ol>

## Semester-I

	<p>Edition, 2011.</p> <ol style="list-style-type: none"> <li>3. Evidence-based Medicine Working Group. Evidence-based medicine. A new approach to teaching the practice of medicine. JAMA 1992;268:2420-5.</li> <li>4. Straus SE, Glasziou P, Richardson WS, Haynes RB. Evidence-based medicine: How to practice and teach it, 4th ed. Churchill Livingstone, Elsevier: Edinburgh, 2011.</li> <li>5. Malterud K, Bjelland AK, Elvebakken KT. Evidence-based medicine – an appropriate tool for evidence-based health policy? A case study from Norway. Health Research Policy and Systems. 2016;14(1):15.</li> </ol>
Additional suggested reading materials	
Instructors	
Course Coordinator	
Venue of Study	

## Semester-I

### Module 6: Introduction to Bio statistics

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Introduction to Biostatistics</b>
Number of Credits	1/30 hrs.
Session/Academic Year	Semester 1/ I year
Course Description	This module is intended for students to acquire knowledge on the basic bio-statistics
Course Outline	Introduction to bio-statistics; Nature and Types of data; Distributional pattern of a variable; Measures of central tendency and dispersion; Introduction to probability and probability distributions; Statistical testing and confidence intervals; Introduction to non-parametric tests; Correlation and regression; Sampling methodology including sample size estimation;
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Altman, G., Practical statistics for medical research. 1991, London: Chapman &amp; Hall.</li> <li>2. Daniel, W., Biostatistics: A foundation for Analysis in the health sciences. sixth ed. 1995, New york: John Wiley &amp; Sons.</li> <li>3. Hosmer, D. and S. Lemeshow, Applied logistic regression. 2 ed. 2000, New York: John Weiley &amp; Sons, Inc.</li> <li>4. Kleinbaum, D., et al., Applied regression analysis and other multivariable methods. 1998, Washington: Duxbury Press.</li> <li>5. Mann, P., Introductory statistics. sixth ed. 2007, Asia: John Wiley &amp; Sons</li> <li>6. Michael, J. and M. David, Medical statistics. second ed. 1993, New york: John Wiley &amp; Sons.</li> <li>7. Pangano, M. and K. Gauvreau, Principles of biostatistics. 1993, California: Wadsworth.</li> <li>8. Rosner, B., Fundamentals of biostatistics. 2000, California: Duxbury. Manosuthi W, Sungkanuparph S, Vibhagool A, Rattanasiri S, Thakkinstian A. Nevirapine- versus efavirenz-based highly active antiretroviral therapy regimens in antiretroviral-naive patients with advanced HIV infection. HIV Med. 2004 Mar;5(2):105-9.</li> </ol>
Additional suggested reading materials	
Instructors	
Course Coordinator	
Venue of Study	

## Semester-II

### Semester II

**Total Duration - 6 Months**

**Semester Description:** The second semester includes Biostatistics, Priority setting in universal health coverage, Economic evaluation in Health, Effectiveness and efficiency in Health, Health equity and social impact of health technology.

### Semester Modules:

SI No	Modules	Credits (Teaching Hours)	Weeks (6hr/ day*5 Days)
1	Biostatistics	3 (90 hrs.)	3 weeks
2	Priority setting in universal health coverage	3 (90 hrs.)	3 Weeks
3	Economic evaluation in Health	3 (120 hrs.)	4 Weeks
4	Pharmaco-economics	1 (30 hrs.)	1 week
5	Effectiveness and efficiency in Health	2 (60 hrs.)	2 weeks
6	Health equity and social impact of health technology	3 (90 hrs.)	3 Weeks
7	Dissertation protocol development/Selection of 3 specific topic/ Problem statement of HTA interest,		
	<b>Total</b>	<b>15 (450 Hrs.)</b>	<b>15 weeks</b>

## Semester-II

### Module 1: Biostatistics - II

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Biostatistics - II</b>
Number of Credits/ hours of teaching	3 / 90 hrs.
Session/Academic Year	II Sem/I year
Course Description	This module introduces concept of Biostatistics and conduction of statistical Analysis
Course Objective(s)	<ul style="list-style-type: none"> <li>● Use data from qualitative and /or quantitative, discrete and continuous variables;</li> <li>● Use appropriate tables, graphs, charts and diagrams to present the data;</li> <li>● Compute proportions/means/medians/modes or ratios and variance;</li> <li>● Compute area under the normal curve;</li> <li>● Use random numbers to select a simple random sample, understand the concepts of other sampling procedures and compute appropriate sample size using formulae/software;</li> <li>● Compute a simple linear correlation coefficient,</li> <li>● Understand the concept of simple linear regression;</li> <li>● Understand the utility of Analysis of variance, multiple linear regression, standardization of rates and survival analysis</li> </ul>
Course Outline	Introduction to biostatistics; Data collection; Types of data; Transformation of Data; Hypothesis testing for a single group; Parametric methods; Non-parametric methods; Hypothesis testing for two groups; Paired samples; Independent samples; Hypothesis testing; Parametric methods; Non- Parametric methods; Correlation; Regression; Statistical software (Excel-stat, Epi-stats, R-stats, PSPP, SPSS).
Teaching Methods	Teaching is by lectures, seminar discussions and group exercises.
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.



## Semester-II

Course materials	<ol style="list-style-type: none"> <li>9. Altman, G., Practical statistics for medical research. 1991, London: Chapman &amp; Hall.</li> <li>10. Daniel, W., Biostatistics: A foundation for Analysis in the health sciences. sixth ed. 1995, New york: John Wiley &amp; Sons.</li> <li>11. Hosmer, D. and S. Lemeshow, Applied logistic regression. 2 ed. 2000, New York: John Weiley &amp; Sons, Inc.</li> <li>12. Kleinbaum, D., et al., Applied regression analysis and other multivariable methods. 1998, Washington: Duxbury Press.</li> <li>13. Mann, P., Introductory statistics. sixth ed. 2007, Asia: John Wiley &amp; Sons</li> <li>14. Michael, J. and M. David, Medical statistics. second ed. 1993, New york: John Wiley &amp; Sons.</li> <li>15. Pangano, M. and K. Gauvreau, Principles of biostatistics. 1993, California: Wadsworth.</li> <li>16. Rosner, B., Fundamentals of biostatistics. 2000, California: Duxbury.</li> <li>17. Manosuthi W, Sungkanuparph S, Vibhagool A, Rattanasiri S, Thakkinstian A. Nevirapine- versus efavirenz-based highly active antiretroviral therapy regimens in antiretroviral-naive patients with advanced HIV infection. HIV Med. 2004 Mar;5(2):105-9.</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-II

### Module 2: Priority setting in Universal Health Coverage

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Priority setting in Universal Health Coverage</b>
Number of Credits	3 (9 hrs.)
Session/Academic Year	II Sem/1year
Course Description	This module introduces the concept of Universal health coverage, transition towards Universal Health Coverage and the process of priority setting Strategic purchasing. (one credit module)
Course Objective(s)	<ul style="list-style-type: none"> <li>● Define the concept of Universal health coverage.</li> <li>● Describe priority setting method and process, designing benefit package, role of each group of stakeholders in priority setting.</li> <li>● Understand effective skills to communicate with stakeholders.</li> <li>● Evaluate accountability, fairness, ethics, and good governance in priority setting.</li> <li>● Utilize HTA evidence in priority setting and multi-criteria decision analysis.</li> <li>● Experience lesson learnt from countries regarding priority setting for universal health coverage, and role of HTA in UHC.</li> </ul>
Course Outline	<p>Introduction: Concept of UHC, Introduction to the course, - Basic concept of universal Health, coverage, -Priority setting public health expenditure</p> <p>Priority setting method and process, Basic concept of priority setting, Priority setting method and process, Basic concept of healthcare benefit package</p> <p>-Definition of a healthcare benefit package, - Usefulness and limitations of healthcare benefit package.</p> <p>Designing benefit package.</p> <p>Implementation of health benefit package for UHC: Implementation of ayushman bharat in India</p> <p>Multi-criteria decision analysis (MCDA) for priority setting: Basic concept of MCDA, MCDA methodology, The potential applications of MCDA in health resource allocation, Weighting in MCDA:- Fairness, ethic, and good governance in priority setting</p> <p>Roles of HTA in designing healthcare benefit packages: - Basic concept of HTA, -The potential applications of HTA in health resource allocation, - Strengths and limitations of using</p>

## Semester-II

	HTA in development of healthcare benefit package The historical development of the UHC benefit package and current scenario in India: The historical development of the UHC benefit package, Comparing the Indian experience with international practices, the future development of the UHC benefit package, Implementation of Ayushman Bharat in India. Effective skill to communicate with stakeholders: Education visit to National Health Mission director office, Education visit to CEO of ayushman bharat office.
Teaching Methods	Short lectures, Assignment presentations, Discussions, Group Exercises
Measurement and Evaluation of Student Achievement	Oral presentation, Assignment, Group Exercises
Course Evaluation	The course is evaluated by students regarding academic quality and management.
Course materials	<ol style="list-style-type: none"> <li>1. Glassman A, Chalkidou K, Giedion U, Teerawattananon Y, Tunis S, Bump J.B., Pichon-Riviere A. Priority-Setting Institutions in Health: Recommendations from a Center for Global Development Working Group. <i>Global Heart</i>. 2012; 7(1): 13-34.</li> <li>2. Youngkong S, Baltussen R, Tantivess S, Mohara A, and Baltussen R. Multi-criteria decision analysis for including health interventions in the universal health coverage benefit package in Thailand. <i>Value in Health</i> 2012; 15(6): 961-970.</li> <li>3. Tantivess S, Velasco R, Yothasamut J, Mohara A, Limprayoonyong H, Teerawatananon Y. Efficiency or Equity: Value judgments in coverage decisions in Thailand. <i>Journal of Health Organization and Management</i> 2012; 26(3). 331-342.</li> <li>4. Teerawattananon Y, Tantivess S, Yothasamut J, Kingkaew P, Chaisiri K. Historical development of health technology assessment in Thailand. <i>Int J Technol Assess Health Care</i>. 2009 Jul; 25 Suppl 1: 241-52.</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-II

### Module-3: Economic evaluation in Health

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Economic evaluation in Health</b>
Number of Credits/ hours of teaching	3(90 Hrs)
Session/Academic Year	II Semester/I year
<b>Course Description</b>	This module explores in detail the key economic concepts, Application of economic concepts on financing and delivering of health programs, Market failure in health care and financing services, a guideline for assessment of economic evaluation and Application of economic evaluation in health technology assessment and health care practice.
<b>Course Objective(s)</b>	<p>At the end of this course, students will be able to</p> <ul style="list-style-type: none"> <li>● describe key economic concepts for making choices on efficiency, demand and costs of production;</li> <li>● apply the concepts of elasticity of demand, marginal analysis and opportunity cost;</li> <li>● apply the basic market model, market failure and the roles and limitations of markets and governments in the finance and organization of health care;</li> <li>● describe how different health systems generate incentives for managers and health care professionals, and likely outcomes in terms of efficiency and equity;</li> <li>● analyze issues in measurement of costs and benefits of health care; and</li> <li>● Apply the principles of economic evaluation as applied to health technology assessment</li> </ul>
<b>Course Outline</b>	<p>Introduction to Economic, Evaluation for Health Technology Assessment: -Purposes of health economics, -Problems for which health economics offers useful insight, *Application of health technology in solving public health problems.</p> <p>Demand for health care: -Introduction to the idea of demand, and demand for Health, health care and health technology, Responsiveness of demand to price/ income;-Cross elasticity;-Normal and inferior goods; elasticity and demand for health care; elasticity and Health.</p> <p>Markets - how they work and how they can fail? :- Markets and market failure.-Demand &amp; supply - the basic market, model, The usefulness of markets in allocating resources, Market failure, Regulating health care markets</p> <p>Production of Health and health care: efficiency use of</p>

## Semester-II

resource: -Ways in which different inputs can be put together to produce Health, health services and the transferred technology

Economic Analysis in health care; - Why economic Analysis, the government and private mix, technical and allocative efficiency, -Common allocation mechanisms, - Alternative allocation models, forms of economic Analysis

Introduction to the economics of health care finance: -Basic health economics. -Principles to explore the alternative ways in which health services can be financed. -Advantages and disadvantages of Each alternative ways.-Emphasis on evidence of government failure in health care finance and delivery.

Introduction to the economic evaluation of health services: - Why is economic evaluation needed? -Sources of demand for economic valuations in Health. Efficiency and equity.- Decision questions that can be addressed by economic evaluation.

Measuring health service costs: economies of scale and scope: --Analysis of production, concerned with the resulting costs, and how they vary with scale and scope. -How the use of the wrong mix of factors can increase cost.

Health Care Financing;-Issues in finance and delivery of health programmes.-Conditions under which normal markets and insurance markets work.-Why they often fail in health care and financing services.-Health care financing is concerned with access to health care and financial protection against the risk of incurring very high expenditures for health care.-Services provided to individuals rather than “health” more broadly.

Framing of EE..

Measuring costs and benefit in economic evaluation, time value and discounting -Theoretical and practical issues in measuring costs in economic evaluation. to consider when costs are incurred.- Discuss time value of money and discounting. Types of cost analysis includes cost-of-illness Analysis, cost minimization analysis, cost-effectiveness analysis, cost-utility Analysis, cost consequence, Analysis, cost-benefit Analysis. Alongside clinical trial economic evaluation

Concept of health care reform;-Objectives of health care reform in developing countries -The component of health care, reform Experiences in India including objectives of health care reform in India

Equity in Health:- Equality of resource allocation for health care delivery.-Inequity in terms of health status income and wealth distribution.-Geographical and financial access to health care.-Great variation in per capita budget subsidy for beneficiaries under various health insurance or welfare schemes

## Semester-II

	<p>Cost and outcome:- Costs and related economic implications comprise a major group of methods used in HTA.-Cost data from one or more such sources are combined with data from primary clinical studies, epidemiological studies, and other sources to conduct cost-effectiveness, cost benefit analyses - Other cost studies that involve weighing Health and economic impacts of health technology.</p> <p>Disability-adjusted life years (DALYs):-Introduction of a unit of health care status that adjusts age-specific life expectancy by the loss of Health and years of Life due to disability from disease or injury.</p>
Teaching Methods	Short lectures, Assignment presentations, Discussions, Group Exercises
Measurement and Evaluation of Student Achievement	Oral presentation, Assignment, Group Exercises
Course Evaluation	The course is evaluated by students regarding academic quality and management.
Course materials	<ol style="list-style-type: none"> <li>1. Mooney, G. (1994) Key issues in health economics, Harvester Wheat sheaf</li> <li>2. Folland, S., Goodman, A.C., and Stano, M. (1997) The economics of Health and health care, (2rd Ed) Prentice Hall, Upper Saddle River, New Jersey</li> <li>3. Drummond, M.F., O' Brien, B., Stoddart, G.L., and Torrance, G.W. (1997) Methods for the economics evaluation of health care programmes, 2 d edition, Oxford Medical Publications</li> <li>4. Barr, N (1998), The Economics of the Welfare State, 3rd edn, Oxford University Press</li> <li>5. Eddy, D. Cost-effectiveness analysis – A conversation with my father, Journal of the American Medical Association, 1992; 267: 1669-1675.</li> <li>6. Cichon, M., Newbrander W, Yamabana H et al. Modeling in health care finance.Geneva, ILO and ISSA, 1999. Issues Brief 1 Concepts of Health Economics pp223 – 235</li> <li>7. Lee, K. and Mills A. Developing countries, health and health economics, Chapter 1 in The Economics of Health in Developing Countries. Oxford, Oxford University Press, 1983</li> <li>8. 8. Cichon, M., Newbrander W, Yamabana H et al Modeling in healthcare finance. Geneva, ILO and ISSA, 1999. Issue Brief 1 Concepts of Health Economics pp2350243</li> <li>9. Borren, P., and Sutton, M. Are increases in cigarette taxation regressive? Health Economics, 1992; 1:245-253.</li> <li>10. McPake, B. User charges for health service in developing countries: a review of the economic literature. Social Science and Medicine, 1993; 36: 1397-1405.</li> <li>11. Culyer. Anthony (1993), 'Health Care Insurance and Provision', Ch 8 in Barr, Nicholas, and Whyne, David</li> </ol>

## Semester-II

	<p>(eds) (1993), Current Issues in the Economics of Welfare, Macmillan</p> <ol style="list-style-type: none"> <li>12. Bobadilla, J.-L., Cowley, P., Musgrove, P., Saxenian, H. (1994) Design, Content and financing of an essential national package of health service, Bulletin of the World Health Organisation, 171-180</li> <li>13. Abel Smith, Brian (1992), 'Health insurance in developing contries: lessons from experience', Health Policy and Planning, 7(3): 215-226.</li> <li>14. Abel Smith, Brian (1994), An Introduction to Health Policy, Planning and Financing, London: Longman, Ch. 11, 12 and 13 (introductory)</li> <li>15. Glennerster, Howard (1996), Paying, for Welfare: Towards 2000, London: Harvester Wheatsheaf, Chs 2, 3 and 10.</li> <li>16. Stiglitz, Joseph E (1988), The Economics of the Public Sector, 2nd edn., Norton, NewYork and London, Ch 1 1 (introductory).</li> <li>17. Ron, A, Tamburi, G, and Abel Smith, B (1990), Health Insurance in Developing Countries: the Social Security Approach, Geneva: ILO, Ch. 2.</li> <li>18. Kutzin, J. (2000) Towards universal health care coverage: A goal-oriented framework for policy analysis, July, World Bank, Washington DC</li> <li>19. Sculpher M 'Economic evaluation' in Fulop N et al (eds.) Studying the organization and delivery of health services: Research methods. London: Routledge 2001</li> <li>20. Drummond, M. and Jefferson, T. Guidelines for authors and peer reviews of economic submissions to the BMJ. British Medical Journal, 1996; 313: 275-283</li> <li>21. Arnesen T, Nord E. The value of DALY life: problems with ethics and validity of disability-adjusted life years. BMJ. 2000;320:1398</li> <li>22. Gold MR, Stevenson D, Fryback DG. HALYS and QALYS and DALYS, oh my: similarities and differences in summary measures of population health. Annu Rev Public Health. 2002;23:115-34.</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-II

### Module – 4 Pharmacoeconomics

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Pharmaco-economics</b>
Number of Credits/ hours of teaching	1/ 30 hours
Session/Academic Year	II Sem/I Year
Course Description	
<b>Course Objective(s)</b>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of Pharmacoeconomics.</li> <li>• Understand the Pharmacoeconomic decision analysis methods and its applications.</li> <li>• Describe current Pharmacoeconomic methods and issues.</li> <li>• Know the applications of Pharmacoeconomics to various pharmacy settings</li> </ul>
Course outline	Introduction to Pharmacoeconomics; Importance of Pharmacoeconomics; Relationship of Pharmacoeconomics to Other Research; Types of Pharmacoeconomic Studies; Clinical Perspectives in Pharmacoeconomics; Pharmacoeconomics- From Theory to Practice; Essentials of Pharmacoeconomics; Applications of Pharmacoeconomics
Teaching Methods	Short lectures, Assignment presentations, Discussions, Group Exercises
Measurement and Evaluation of Student Achievement	Oral presentation, Assignment, Group Exercises
Course Evaluation	The course is evaluated by students regarding academic quality and management.
Course materials	<ol style="list-style-type: none"> <li>1. Rascati Karen L. Essentials of Pharmacoeconomics, Second Edition, Lippincott Williams &amp; Wilkins, 2013; ISBN -10 number: 1451175930</li> <li>2. Pharmacoeconomics and outcomes: Applications for patient care, case studies. Authors: Graer DW, Lee J, Odom TD, et al. American college of clinical pharmacy-2003. b.</li> <li>3. Introduction to Applied Pharmacoeconomics, F. Randy Vogenberg, New York; London: McGraw-Hill, c. Pharmacoeconomics Editor Brian L Storm, John Wiley and Sons, Ltd 4th edition,</li> </ol>
Instructors	
Course Coordinator	
Venue of study	



## Semester-II

### Module 5: Effectiveness and efficiency in Health Technology

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Effectiveness and efficiency in Health Technology</b>
Number of Credits/ hours of teaching	2/ 60 hours
Session/Academic Year	II Sem/I Year
Course Description	<p>This module introduces strategies to enhance effectiveness and efficiency of health technology; effectiveness and efficiency assessment methods of health technology; Application of effectiveness and efficiency assessment results in policy decision making; conducting research projects in effectiveness and efficiency assessment of health technology; moral and ethics in effectiveness and efficiency assessment of health technology; gaining research experience in research organizations related to effectiveness and efficiency assessment of health technology</p> <p>ii. To link with Epi module – to get/determine effectiveness measures (primary/secondary/ )...</p> <p>iii. Link with stats module: statistical measures.. (OR, RR, RD.. with practical things)</p>
Course Objective(s)	To evaluate evidence for its technical quality, completeness and relevance of health technology assessment
Course outline	<p>Overview and introduction of cost-effectiveness statistics using person-level data, Cost-effectiveness estimates using person-level data</p> <p>Application: Potential role of HTA in creating real-world evidence,</p> <p>Uncertainty - parametric and non-parametric methods I &amp;II,HTA and the threshold: what is the purpose of HTA and what characterizes a well-chosen threshold ICER?</p> <p>Efficiency and equity: what are they, do they conflict, which is more important? Market and state in healthcare finance and provision.</p> <p>Does each have a useful role? HTA and a Reference Case.</p> <p>Indian Reference case &amp; Is the Gates/iDSI Reference Case a good model?</p> <p>Judging systems: what characterizes a ‘good’ healthcare system and how can these characteristics be created and maintained?</p> <p>Dynamic model for evaluating effectiveness and efficiency</p>

## Semester-II

	of health technology.
Teaching Methods	Short lectures, Assignment presentations, Discussions, Group Exercises
Measurement and Evaluation of Student Achievement	Oral presentation, Assignment, Group Exercises
Course Evaluation	The course is evaluated by students regarding academic quality and management.
Course materials	<ol style="list-style-type: none"> <li>1. Hoch JS, Dewa CS. "A clinician's guide to correct cost-effectiveness analysis: think incremental not average." <i>Can J Psychiatry</i>. 2008;53(4):267-74.</li> <li>2. Briggs AH, O'Brien BJ. "The death of cost-minimization analysis?" <i>Health Econ</i>. 2001;10(2):179-84.</li> <li>3. Ramsey, S. D., Willke, R. J., Glick, H., Reed, S. D., Augustovski, F., Jonsson, B., ... &amp; Sullivan, S. D. (2015). Cost-effectiveness analysis alongside clinical trials II—an ISPOR Good Research Practices Task Force report. <i>Value in Health</i>, 18(2), 161-172.</li> <li>4. Hoch JS, Briggs AH, Willan AR. "Something old, something new, something borrowed, something blue: a framework for the marriage of health econometrics and cost-effectiveness analysis." <i>Health Econ</i>. 2002;11(5):415-30.</li> <li>5. Isaranuwatthai, W., Markle-Reid, M., &amp; Hoch, J.S. Adjusting for baseline covariates in net benefit regression: How you adjust matters. <i>PharmacoEconomics</i>. 2015 Oct;33(10):1083-1090.</li> <li>6. Hoch JS, Rockx MA, Krahn AD. "Using the net benefit regression framework to construct cost-effectiveness acceptability curves: an example using data from a trial of external loop recorders versus Holter monitoring for ambulatory monitoring of "community acquired" syncope." <i>BMC Health Serv Res</i>. 2006 Jun 6;6:68.</li> <li>7. Chaudhary MA, Stearns SC. "Estimating confidence intervals for cost-effectiveness ratios: an example from a randomized trial." <i>Stat Med</i>. 1996 Jul 15;15(13):1447-58.</li> <li>8. Briggs AH, O'Brien BJ. "Thinking outside the box: Recent advances in the analysis and presentation of uncertainty in cost-effectiveness studies" <i>Annual Review of Public Health</i>. 2002;23:377-401.</li> <li>9. Briggs A, Fenn P. "Confidence intervals or surfaces? Uncertainty on the cost-effectiveness plane." <i>Health Econ</i>. 1998 ;7(8):723-40.</li> </ol>

## Semester-II

10. O'Brien BJ, Briggs AH. "Analysis of uncertainty in health care cost-effectiveness studies: an introduction to statistical issues and methods." *Stat Methods Med Res.* 2002;11(6):455-68.
11. Fenwick E, O'Brien BJ, Briggs A. "Cost-effectiveness acceptability curves--facts, fallacies and frequently asked questions." *Health Econ.* 2004;13(5):405-15.
12. Groot Koerkamp B, Hunink MG, Stijnen T, Hammitt JK, Kuntz KM, Weinstein MC. "Limitations of acceptability curves for presenting uncertainty in cost-effectiveness analysis." *Med Decis Making.* 2007;27(2):101-11.
13. Khor, S., Beca, J., Krahn, M., Hodgson, D., Lee, L., Crump, M., ... & Sawka, C. (2014). Real world costs and cost-effectiveness of Rituximab for diffuse large B-cell lymphoma patients: a population-based analysis. *BMC cancer*, 14(1), 586.
14. Isaranuwatthai, W., Brydges, R., Carnahan, H., Backstein, D., & Dubrowski, A. Comparing the cost-effectiveness of simulation modalities: a case study of peripheral intravenous catheterization training. *Advances in Health Sciences Education.* 2014;19(2):219-232.
15. A J Culyer, Cost-effectiveness thresholds in health care: a bookshelf guide to their meaning and use, *Health Economics, Policy and Law*, 2016, 11: 415-432.
16. K Claxton, Martin S, Soares M, Rice N, Spackman E, Hinde S, et al. Methods for the estimation of the National Institute for Health and Care Excellence cost-effectiveness threshold. *Health Technology Assessment*, 2015, 19: 1-503
17. K J Arrow, Uncertainty and the welfare economics of medical care, *American Economic Review*, 1963, 53, 941-73.
18. A J Culyer, The welfarist and extra-welfarist economics of health care finance and provision, in A J Culyer, *The Humble Economist: Tony Culyer on Health, Health Care and Social Decision Making*, (eds. R A Cookson and K Claxton), London and York: Office of Health Economics and University of York, 2012. (freely downloadable)
19. W B F Brouwer, A J Culyer, N Job, A van Exel, F F H Rutten, Welfarism vs. extra-welfarism, *Journal of Health Economics*, 2008, 27: 325-338.
20. R Klein (1997) Learning from others: shall the last be the first? *Journal of Health Politics, Policy and Law*, 22: 1267-1278.
21. T Marmor, R Freeman, K Okma (2005) *Comparative*

## Semester-II

	<p>perspectives and policy learning in the world of health care, <i>Journal of Comparative Policy Analysis</i>, 7: 331-348.</p> <p>22. Chloe Anderson, <i>Multinational Comparisons of Health Systems Data</i>, 2014, <a href="http://www.commonwealthfund.org/topics/current-issues/multinational-comparisons-of-health-systems-data">http://www.commonwealthfund.org/topics/current-issues/multinational-comparisons-of-health-systems-data</a>.</p>
Instructors	
Course Coordinator	
Venue of study	

## Semester-II

### Module 6: Health equity and social impact of health technology

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Health equity and social impact of health technology</b>
Number of Credits/ hours of teaching	3/120Hrs
Session/Academic Year	II Sem/I Year
Course Description	This module explores health technology in the context of health system and society, assessing the impact of health technology and health technology assessment (HTA) on society, factors affecting the impact of HTA, moral and ethics in impact assessment of health technology on society and case studies of impact of health technology on society, Health Equity, Distributional/Extended CEA. The processes in HTA and stakeholder's management and communication methods.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Define the concept of health technology in health systems and society; impact health technology on society, and impact HTA on society.</li> <li>● Describe factors affecting the impact of HTA; assessment methods of the impact of health technology on society; moral and ethics in impact assessment of health technology on society.</li> <li>● Evaluate case studies of the impact of health technology on society</li> <li>● Health Equity, Distributional/Extended CEA</li> </ul>
Course outline	<p>Course introduction Health technology and impact to society.</p> <p>Health technology in social perspective: How social scientists see health technologies and their impacts:-, Health and Society, Human and technology, Body, identity and the meaning of Health, Health technologies and social relations, Sociological views on health technology, Anthropological views on health technology,</p> <p>Program evaluation- Evaluation process- Basic evaluation issues,- Evaluation designs, Assessing impact of health technology: case study of compulsory licensing in India, Assessing impact of health technology for international trade and Health</p> <p>Evaluating impacts of health policy implementation: A case study of India's health universal coverage scheme-Healthcare seeking behavior,- Catastrophic health expenditures,- Implications to equity of access to health</p>

## Semester-II

	<p>care,- Policy, implications, Theoretical/ methodological consideration</p> <p>Principle of social impact and social impact assessment-Defining social impact,- Role of social impact assessment,- Concepts and assessment criteria for social impact assessment Common methodologies and tools used for social impact assessment,</p> <p>Evaluating impacts of health policy implementation: A case study of the promotion of herbal medicine use in Thai communities, Main concept: medical pluralism and community health systems, Modern medicine vs. the alternatives, - Health and livelihood, Impacts of the program at the individual, household, community and facility level, Theoretical/ methodological consideration Including the processes in HTA and stakeholder's management and communication methods with field visit.</p> <p>Field visit/work: health technology impacts on clinical and non-clinical patient outcomes and its interactive effects on economical, organizational, social, juridical and ethical aspects of healthcare [critical perspectives on social impacts of health technologies]</p>
Teaching Methods	Short lectures, Assignment presentations, Discussions, Group Exercises
Measurement and Evaluation of Student Achievement	Oral presentation, Assignment, Group Exercises
Course Evaluation	The course is evaluated by students regarding academic quality and management.
Course material	<ol style="list-style-type: none"> <li>1. Hanney S, Buxton M, Green C, Coulson D, Raftery J. An assessment of the impact of the NHS Health Technology Assessment Programme. <i>Health Technol Assess.</i> 2007; 11(53): iii-iv, ix-xi, 1-180.</li> <li>2. Henshall C, Koch P, von Below GC, Boer A, et al. Health technology assessment in policy and practice. <i>Int J Technol Assess Health Care.</i> 2002; 18(2): 447-55.</li> <li>3. Jacob R, McGregor M. Assessing the impact of health technology assessment. <i>Int J Technol Assess Health Care.</i> 1997; 13(1): 68-80.</li> <li>4. Sorensen C, Drummond M, Kristensen FB, Busse R. How can the impact of health technology assessments be enhanced? European Observatory for Health Systems and Policies. Copenhagen: WHO Regional Office for Europe, 2008.</li> <li>5. Zechmeister I, Schumacher I. The impact of health technology assessment reports on decision making in</li> </ol>

## Semester-II

	Austria. Int J Technol Assess Health Care. 2012; 28(1): 77-84.
Instructors	
Course Coordinator	
Venue of study	

## Semester-III

### Semester III

**Total Duration - 6 Months**

**Semester Description:** This semester is about the Application of methods learnt in the first 2 semesters and conducts a complete economic evaluation.

#### Semester Modules:

Sl. no	Module	Credits (teaching hours)	Duration
1	Costing in Health	4 (120 hrs.)	4 weeks
2	Measuring Health outcomes	2 (60 hrs.)	2 weeks
3	Model-based Economic Evaluation	5 (150 hrs.)	5 weeks
4	Evidence Synthesis	4 (120 hrs.)	4 weeks
	Field visit III to one of the HTA Resource Centre		
	<b>Total</b>	<b>15 (450 hrs.)</b>	<b>15 Weeks</b>



## Semester-III

### Module 1: Costing in Health

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Costing in Health</b>
Number of Credits/Teaching hours	4/120 hours
Session/Academic Year	Semester III/ II Year
Course Description	This module introduces and gives in depth knowledge on the principles and methods of costing, perspective, cost centers identification and cost Analysis
Course Objective(s)	<ul style="list-style-type: none"> <li>● Define the concept of costing and cost Analysis</li> <li>● To design and conduct costing of health care services,</li> <li>● To design and conduct costing of health care programs</li> <li>● To design and conduct cost of illness studies</li> <li>● WTP/TTO/ gambling.</li> </ul>
Course Outline	Introducing the costing concept and cost analysis in HTAs; Types of cost; Costing approaches- top down, bottom up and mixed methods; perspective, Concept of discounting and inflation; Identification of cost centres; costing of health care services; cost of illness; Cost of risk factors; costing of healthcare programs; Sources of cost data for economic evaluation; Quality of costing studies; Statistics in costing
Teaching Methods	Each session is composed of lectures followed by seminars, assignments, practice exercises and self-study
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Kobelt G. Health Economics: an Introduction to Economic Evaluation. second ed. London: Office of Health Economics; 2002.</li> <li>2. Drummond M, McGuire A. Economic evaluation in health care: merging theory with practice. Oxford: Oxford University Press 2001</li> <li>3. Kumaranayake L, Pepperall J, Goodman H, Mills A, Walker D. Costing guidelines for HIV prevention strategies. Geneva: UNAIDS; 2000.</li> <li>4. Vaccine Assessment and Monitoring Team. Guidelines for estimating the economic burden of</li> </ol>

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	<p>diarrhoeal disease with focus on assessing the costs of rotavirus diarrhoea. Geneva: Department of Immunization, Vaccines and Biologicals, World Health Organization; 2005.</p> <ol style="list-style-type: none"><li>5. Ozaltin A, Cashin C, editors. Costing of Health Services for Provider Payment: A Practical Manual Based on Country Costing Challenges, Trade-offs, and Solutions: Joint Learning Network for Universal Health Coverage; 2014.</li><li>6. Riewpaiboon A. Computer-Based Health Care Cost Analysis. Bangkok, Thailand: Division of Social and Administrative Pharmacy, Department of Pharmacy, Faculty of Pharmacy, Mahidol University; 2013.</li><li>7. Zsolt Mogyorosy &amp; Peter Smith, 2005. "The main methodological issues in costing health care services: A literature review," Working Papers 007cherp, Centre for Health Economics, University of York.</li></ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-III

### Module 2: Measuring Health outcomes

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Measuring Health outcomes</b>
Number of Credits/Teaching hours	2/80 hours
Session/Academic Year	Semester III/ II Year
Course Description	This module explains the methods of quantifying health outcomes, generic and disease specific scales, QALY, DALY, Human Development Index
Course Objective(s)	<ul style="list-style-type: none"> <li>● To synthesize evidence on clinical effectiveness and health utility</li> <li>● Understand what is Health-related quality of Life and learn how to measure Health-related quality of Life</li> </ul>
Course Outline	Clinical events; Patient-reported outcomes; Outcome measurement in chronic diseases; Monetary outcomes; Concept of Quality-adjusted life years; Concept of Disability-adjusted life years; Health-related quality of Life (HRQoL); Direct and indirect valuation; HRQoL instruments; Generic questionnaires and Disease-specific questionnaires; EuroQoL-5 dimension (EQ5D); Short Form-36 (SF-36); Human Development Index (HDI)
Teaching Methods	Each session is composed of lectures followed by seminars, assignments, practice exercises and self-study. Students must bring their own notebook computer for practice
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Nancy Devlin, David Parkin, Bas Janssen. Methods for Analysing and Reporting EQ-5D Data, Springer International Publishing, 2020. doi. 10.1007/978-3-030-47622-9</li> <li>2. Pavlovic M, Teljeur C, Wieseler B, Klemp M, Cleemput I, Neyt M. Endpoints for relative effectiveness assessment (REA) of pharmaceuticals. Int J Technol Assess Health Care. 2014 Nov;30(5):508-13. doi: 10.1017/S0266462314000592.</li> <li>3. Janssen BM, Oppe M, Versteegh MM, Stolk EA.</li> </ol>

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	Introducing the composite time trade-off: a test of feasibility and face validity. Eur J Health Econ. 2013 Jul;14 Suppl 1(Suppl 1):S5-13. doi: 10.1007/s10198-013-0503-2. PMID: 23900660; PMCID: PMC3728457.
Additional suggested reading materials	
Instructors	
Course Coordinator	
Venue of Study	

## Semester-III

### Module 3: Model-based Economic Evaluation

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Model-based Economic Evaluation</b>
Number of Credits/Teaching hours	4/ 120 hours
Session/Academic Year	Semester III/II Year
Course Description	This module introduces economic models and covers the important aspects of cost-effectiveness modeling including decision tree model, markov model, discounting, uncertainty analysis, probabilistic modeling, Budget impact analysis and Dynamic models.
Course Objective(s)	<ul style="list-style-type: none"> <li>● Explain the concept and methodology to conduct model-based economic evaluation in healthcare</li> <li>● Conduct model-based economic evaluation in healthcare</li> </ul>
Course Outline	Introduction to economic models; Model parameters-Transition probabilities, cost and utility; Discounting; Excel commands for cost-effectiveness modeling; Survival analysis; Decision tree analysis; Markov Model; Sensitivity analysis; Monte Carlo simulation; Cost-effectiveness acceptability; Budget impact Analysis; Expected value of perfect information (EVPI); Introduction to dynamic model; Application of dynamic model
Teaching Methods	Each session is composed of lectures followed by seminars, assignments, practice exercises and self-study. Students must bring their own notebook computer for practice
Measurement and Evaluation of Student Achievement	<p>Seminars, Assignments, Class tests. Both group work and class participation will be assessed.</p> <p>Each student is required to conduct your own research related to cost-effectiveness analysis or cost-utility Analysis. The research should be conducted to incorporate cost and effectiveness data in your country. The 10-page English final paper (i.e., abstract, introduction, literature review, method, result, and discussion) excluding title and reference along with the model is required to be submitted and presented. Each student is encouraged to submit the research abstract to either national or international conferences.</p>

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Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Bootman JL, Townsend RJ, and McGhan WF. Principles of Pharmacoeconomics, 2nd ed., Ohio: Harvey Whitney Books; 1996.</li> <li>2. Gold MR Siegel JE, Russle LB, Weinstein MC, eds. Cost-effectiveness in Health and medicine. New York: Oxford University Press, 1996; 82-154.</li> <li>3. Cramer, Joyce A and Bert Spilker. Quality of Life and Pharmacoeconomics: An Introduction. Philadelphia: Lippincott-Raven, 1998.</li> <li>4. Drummond M, Sculpher M, Torrance G, O'Brien B, Stoddart G. Methods for the economic evaluation of health care programmes. 3rd ed. Oxford: Oxford University Press 2005</li> </ol>
Additional suggested reading materials	<ol style="list-style-type: none"> <li>1. Richard Edlin, Christopher McCabe, Claire Hulme, Peter Hall and Judy Wright. Cost Effectiveness Modelling for Health Technology Assessment-A Practical course. Adis, 2015 edition. ISBN-10: 3319157434</li> <li>2. Paulden M. Calculating and Interpreting ICERs and Net Benefit. Pharmacoeconomics. 2020 Aug;38(8):785-807. doi: 10.1007/s40273-020-00914-6. Erratum in: Pharmacoeconomics. 2020 Aug 19;: PMID: 32390067.</li> <li>3. Kobelt G. Health Economics: an Introduction to Economic Evaluation. second ed. London: Office of Health Economics; 2002.</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	

## Semester-III

### Module 4: Evidence Synthesis

Program of Study	Master of Science in Health Economics and Technology Assessment
Course Code	
Course Title	<b>Evidence Synthesis</b>
Number of Credits/Teaching hours	4/ 120 hours
Session/Academic Year	Semester III/II Year
Course Description	This module explores different methods of evidence synthesis and explains in detail the conduct of systematic review and meta-analysis
Course Objective(s)	<ul style="list-style-type: none"> <li>● To understand the concept of evidence synthesis different methods of evidence synthesis: scoping review, rapid reviews, umbrella reviews..etc</li> <li>● To be able to conduct literature search, process of selection of studies, evaluating quality of selected evidence.</li> <li>● To estimate pooled effect sizes for hypothesis testing of dichotomous and continuous outcomes</li> <li>● To estimate pooled prevalence, incidence, or mean values for estimation studies.</li> <li>● To apply pooling methods (i.e., fixed and random effects) appropriately</li> <li>● To assess heterogeneity by testing and quantifying a degree of heterogeneity</li> <li>● To exploring possible sour/s of heterogeneity</li> <li>● To assess reporting/publication bias</li> </ul>
Course Outline	Introduction to Systematic review and meta-analysis; Preferred reporting items for systematic review and meta-analysis; Formulating review question and objectives; Identification and selection of studies; Data extraction; Risk of bias assessment; Statistical Analysis; Registration of review protocol; Grading evidence; Pooling effect size for dichotomous outcomes; Pooling effect for continuous outcomes; Pooling effect size for time to event outcome; Assessing Heterogeneity; Publication bias
Teaching Methods	Each session is composed of lectures followed by seminars, assignments, practice exercises and self-study
Measurement and Evaluation of Student Achievement	Seminars, Assignments, Class tests. Both group work and class participation will be assessed. Each student is required to conduct their own systematic

## Semester-III

	review and meta-analysis. Each student is encouraged to submit the research abstract to either national or international conferences.
Course Evaluation	Evaluate student satisfaction towards teaching and learning of the course using a questionnaire.
Course materials	<ol style="list-style-type: none"> <li>1. Egger M, Smith GD, Altman DG. Systematic reviews in health care: Meta-analysis in context. 2 nd ed. London: BMJ Books; 2001.</li> <li>2. Chalmers I, Altman DG. Systematic reviews. London: BMJ Publishing Group; 1995.</li> <li>3. Petitti BD. Meta-Analysis, decision analysis, and cost-effectiveness analysis. Oxford: University Press 1994; pages 91-130, 194-196.</li> <li>4. Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 edn, 2011.</li> </ol>
Instructors	
Course Coordinator	
Venue of Study	