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**EMP 844: Heart Rate Variability in Research and/or Clinical Practice including Self-Exploration (3 Credits)**

**Overview of Course:** The heart is much more than a pump. The heartbeat is an energetic signature of life that has fascinated people since time immemorial, whose presence or absence distinguished life from death. A key frequency component of the human heartbeat is a wavelength corresponding to the height of the Great Pyramid of Giza in Egypt, suggesting that the ancients understood this basic rhythm of life and may have used pyramid technology to enhance it. In this course, we explore the rhythms of the human heart and heart rate variability as an important vital sign in energy medicine. We further explore the physiology of the human heart and blood vessel dynamics in response to stress, relaxation, the emotions, meditation and other altered states of consciousness, the breath, the autonomic nervous system, relationship to others, various conditions and diseases, and interventions that the student wishes to examine. We will examine the evidence that more coherence or regularity in the component heart waves is associated with better physiological regulation, greater positive affect, and optimal wellness. In addition, biofeedback using heart rate variability will also be taught as a regulator of autonomic nervous system function. This course can be adapted to teach a clinical perspective and/or a research perspective as well as an in-depth exploration of oneself, depending upon the needs and interest of the student.

NOTE: There is a laboratory component to this course. The student has an option of coming to the Institute for Frontier Science laboratory in Emeryville, CA, to work for 1 day (8 hours) with Beverly Rubik (additional fee of \$150 payable to Inst for Frontier Science) on professional testing equipment, or to work with HeartMath equipment at home (see [www.heartmath.org](http://www.heartmath.org), to purchase EM Wave device and software). If the student comes to the laboratory, then professional HRV testing equipment (Medicore SA 3000p) with arterial elasticity testing will be used on site. A special student discount has been arranged for EMU students to purchase the device and software directly from HeartMath Institute.

**Course Topics:** history of heart physiology; heart rate variability (HRV); HRV biofeedback; autonomic nervous system and its regulation; role of the breath; affect of thoughts, mood, and positive affect on heart dynamics; affects of spiritual practices and altered states of consciousness on heart dynamics;

**Learning Objectives:**

1. Describe how the human heart is much more than a pump, whose rhythms reflect a person's emotions, mood, breath, state of consciousness, regularity of mind-body-spirit practices, overall wellness, and resilience to stress and disease.
2. Explain heart rate variability, how it is measured, two different measures of it, and how these measures are used in research and in the clinic to assess changes in physiology and measures of health and wellness. What is the significance of various values of heart rate variability?
3. How can a person improve HRV, and what does an improvement mean in terms of clinical outcome? Describe how heart rate variability biofeedback can be used

- to improve resilience to stress and disease and regulate the autonomic nervous system.
4. Describe how arterial stiffness is measured, its clinical significance, and how it may be used as a variable in research.
  5. Explain how heart rate variability changes in response to a successful healthcare intervention (energy medicine, mind-body intervention, and other holistic treatments). Describe how heart rate variability responds to some common pharmaceutical drugs. What do these changes mean?

**Audience:**

Open to all students in the Doctoral program.

**COURSE DESCRIPTION**

Heart Rate Variability (HRV) is the marker of the heart's response to the autonomic nervous system dynamics. It measures the range of heart rate across different phases of the breathing cycle (inhalation and exhalation). When properly interpreted in the context of respiratory and cardiac challenges, it serves as an indicator of heart health as well as the “tone” of the sympathetic and parasympathetic nervous system branches. As monitored noninvasively through the earlobe or finger pulse, it can reveal information about psychophysiological stability and/or distress in response to various external and internal stimuli, with implications for treatment strategies in energy medicine and other holistic interventions. Recently it has gained popularity in the clinic as well as in research. HRV is affected by many factors including breathing behavior, nutrition, obesity, circadian rhythms, the emotions, hormones, certain pharmaceutical drugs, and many chronic diseases. Conditions and disorders such as diabetes, obesity, multiple sclerosis, cancer, depression, chronic anxiety, and cardiovascular disease greatly narrow the dynamic spectrum of heart function, which is readily seen in HRV parameters. On the other hand, holistic interventions, including biofeedback and relaxation exercises, respiratory training, qigong, other mind-body therapies, and biofield therapies have been shown to improve HRV parameters. Consequently, HRV may become a new vital sign in integrative medicine and especially in whole person care. A related measure, acceleration photoplethysmography (APG), which uses the same device as HRV, along with other software and parametrics, and breath training, will also be discussed. APG is an indirect measure of arterial elasticity and vasodilation. **\*NOTE:** This course requires either eight classroom hours of experience using the Medicore SA- 3000p HRV/APG equipment and EM Wave device at the Institute for Frontier Science laboratory in Emeryville, CA, or student may purchase EM Wave equipment from [www.HeartMath.org](http://www.HeartMath.org) and use it at home.

**\*Note:** On site laboratory teaching requires additional laboratory fee, \$150, payable to Inst for Frontier Science.

## NEED STATEMENT

Students will:

- 1) Develop an in-depth awareness of the physiology of the human heart in relation to relaxation, stress, the breath, emotions, thoughts, spiritual practices, altered states of consciousness, health and level of wellness, and disease.
- 2) Understand the foundations of heart dynamical rhythms and their variability in relation to health and wellness, which may be measured on clients in the clinic, and/or testing various interventions on human subjects in research.
- 3) Develop skills needed in identifying elements of the heartbeat pertaining to optimal health and wellness and the physiology of stress and disease.
- 4) Be able to assist clients as practitioners in assessing their overall wellness, resilience to stress, and measuring the effects of health interventions toward improving their autonomic nervous system balance.
- 5) Develop the critical skills needed to think like a clinician and/or researcher in testing human subjects' heart dynamics in the clinic and/or laboratory in a valid and reliable manner.

## FACULTY-STUDENT COMMUNICATION

- **Telephone Contact:** Students should arrange all telephone communications with the instructor by email beforehand. An initial phone contact to clarify course objectives and develop a schedule should be made prior to beginning the course. This contact should be scheduled within the first few weeks of commencement of the semester. After this, periodic telephone communication can be arranged with instructor. All telephone calls will be at student's expense.
- **Email Contact:** Reflection on and questions about the coursework papers and field placement internship should be addressed via email monthly or as needed. Students are always encouraged to contact the instructor via email whenever a problem arises.
- **Communications** It is requested that students stay in weekly or every other week correspondence with the instructor using email. The student should also set up periodic telephone conversations, at their expense, to discuss problems, concerns, or determine the direction of their course work. Students are always encouraged to contact the instructor by email, fax, or telephone whenever a major concern may arise. It should be understood that as mature students, it is the responsibility of the students to stay in contact with their instructors. The instructor may be able to set up one-on-one discussions with the student using Skype. Students should check email frequently for professor and EMU messages.

Students will normally send communications via email and submit papers as MSWORD format files attached to email messages. Synchronous Internet sessions may be used for "chat sessions" using Yahoo Messenger Chat or Skype. Check with your instructor on the type of communications she uses.

**Internet Forums:** Please contact our Registrar to be included in the EMU Internet forums.

**Length of Course:**

Length of this Energy Medicine course is five (5) months or one (1) semester.

**COURSE DELIVERY STYLE**

Distance Education - Coursework is completed at a location determined by the student utilizing a computer that has the ability to play audio and video clips, with Microsoft Office Word, Excel, PowerPoint, Adobe Reader, along with a current web browser, internet connection and email address. Contact and communication with distance students is typically conducted by telephone, Internet, Skype, text chat, and email. Students are also encouraged to contact the University by facsimiles, and postal mail, and by personal visit to the University.

All lessons, coursework and papers must be copied to lessons@energymedicineuniversity.org from both the student and professor.

- 1) Readings: Students will read the course assignments and text materials from the professional literature in the following numerical order. Institute of HeartMath publications may be purchased directly from [www.heartmath.org](http://www.heartmath.org) at a student discount. NOTE: A few other readings will be added to this list according to the student's specific interests in research, clinical use, or self-exploration.
  - (1) Journal of Holistic Care, Volume 3(3), August 2006. {entire issue on the heart, emotions, healing, and holistic care}
  - (2) Rosch PJ (2009) Bioelectromagnetic and subtle energy medicine: the interface between mind and matter. Annals NY Acad Sci 1172:297-311.
  - (3) Thayer JF and Lane RD (2009) Claude Bernard and the heart-brain connection (review paper). Neuroscience and Biobehavioral Reviews 33:81-88.
  - (4) Lombardi F (2000) Chaos theory, HRV, and arrhythmic mortality. Circulation 101: 8-10.
  - (5) O'Brien IA, O'Hare P, Corral RJM (1986). HRV in healthy subjects: effect of age and derivation of normal ranges for tests of autonomic function. Br Heart J 55:348-54.
  - (6) McCraty R, Atkinson M, et al. (2006) Coherent Heart. Boulder Creek, CA: Inst of HeartMath. Pp 1-64.

- (7) McCraty R, Atkinson M, et al. (1995) Effects of emotions on short-term power spectrum analysis of HRV. *Amer J Cardiol* 76(14):1084-1093.
- (8) McCraty R. (2003) *Energetic Heart*. Boulder Creek, CA: Inst of HeartMath. Pp 1-20.
- (9) McCraty R, Tomasino D. (2006) Emotional stress, positive emotions, and psychophysiological coherence. Boulder Creek, CA: Inst of HeartMath, pp. 1-18.
- (10) McCraty R and Childre D (2010) Coherence: bridging personal, social, and global health. (review paper). *Alt. Ther* 16(4):10-24.

**Email Contact:** Reflection on and questions about the lessons should be addressed via email weekly or as needed. There also may be a student/faculty discussion chat group which creates a larger feedback mechanism through internet communication. Students are always encouraged to contact the instructor via email whenever a problem arises.

## 2) Final Paper on a Specific Topic Based on the Professional Literature or a Preliminary Research Project Report

There are 2 options:

- A. Students will conduct library research based on secondary and primary source materials and texts. From this, students will write a paper of at least 20 double-spaced pages (font size 12) plus a reference section (2 to 3 pages) using APA Style Manual. The final paper will consist of a specific topic related to HRV, HRV biofeedback, or arterial stiffness, and must be pre-approved by the instructor. Grades will be given on content, use of source material, and also grammar, spelling, and originality.
- B. Students will conduct a graduate-level preliminary research project using HRV and/or HRV biofeedback on 2 to 3 human subjects, which must be pre-approved by the instructor, and write a research report on the preliminary study. Grades will be given on content, originality and thoroughness of project, also grammar spelling in research report. A template will be provided for the research report. Students should use the APA Style Manual.

## 3) Essay Examination

Students are issued a set of topic assignments, readings and explorations, in preparation for an oral examination of the course materials. A list of essay questions will be jointly developed by the student and instructor, tailored for the specific perspective used in the course. Before the deadline, students will negotiate with the instructor the time and date for the face-to-face, telephone or Yahoo Messenger Voice or Skype conference for this

examination. During the examination, the instructor will make notations of the effectiveness, qualities, and weaknesses of the student's replies.

## COURSE ASSIGNMENTS

### Assignment #1: Readings

Read the 10 papers and e-books listed in the order on page 5 of this syllabus. Note: a few other readings will be provided depending upon the student's specific interests in research, clinical work, or self-exploration.

Assignment #2: Final Paper or Preliminary Research Project Report: See options and full description on page 6 of this syllabus

Assignment #3: Oral Essay Examination: questions and timing of this examination to be negotiated between instructor and student

## INDIVIDUALIZATION OF STUDENT ASSIGNMENTS

Each original paper or research project will be chosen by the student to best support their individual professional goals, yet each student will also benefit from seeing the fruits of all fellow students' research and providing professional criticism of each others work, if more than one student is enrolled in this course in any semester.

Each student will be afforded the opportunity of writing on a subject that is related to his or her field of interest. This will assist the student in making each paper individualized. Also the student is encouraged to go outside the field and obtain research data from other interdisciplinary areas. Each student, based on his or her background, will be encouraged to transfer that theoretical information which the course provides into a practical format in the final paper or project.

## COURSE EVALUATION

The course grade will be based upon the quality of the research paper or project, the use of the class participation and promptness of postings, and the final examination.

## COURSE GRADING DETERMINANTS

Grades are based on the following elements of a student's participation and accomplishment. In determining a grade for this course, the following formula will be used:

Reading required texts and on-line readings – 25%

Course paper or research project – 50%

Essay examination – 25%

Using this technique, there will be 100 points assigned to the course. Final semester grades will be calculated as follows:

92-100 points = A range

86-91 points = B range

80-85 points = C range

70-80 points = D range

Under 70 points = F

#### COURSE COMPLETION TIMETABLE

- Week #1-4: Orientation Skype session and read materials 1, 2 and 3 of Assignment 1.
- Week #5-8: Read materials 4, 5, and 6 of Assignment 1.
- Week #6-10: Second Skype session and read materials 7, 8, and 9 of Assignment
- Week #11-13: Obtain and run EM Wave program on a PC or Mac and become proficient in HRV measurements of yourself. Explore effects of energetic interventions, spiritual practice, etc., on HRV.
- Week #13-15: Run EM Wave biofeedback on a computer and become proficient in HRV biofeedback on yourself or others.
- Week #16: complete term paper or research report; take oral examination

#### SPECIAL NOTES AND INSTRUCTIONS

All coursework must be completed in a timely fashion. Students are encouraged to phone or email the instructor whenever they need advice, comments, or instruction.

#### TEXTS

No physical textbooks; only journal papers and e-books from Institute of HeartMath will be used. See Assignment 1 for a list of required reading materials. Other reading materials will also be added depending upon the student's focus on research, clinical use, or self-exploration.

#### ADDITIONAL RECOMMENDED SOURCES

[www.heartmath.org](http://www.heartmath.org) website: additional e-books available for download